

**KENWOOD**

# **SERVICE MANUAL**

**TR-7400A**



**2m FM TRANSCEIVER**

# INTRODUCTION/CONTENTS

Your KENWOOD Model TR-7400A is a high-quality 2-meter transceiver for use in amateur radio mobile stations as well as base stations. It contains a PLL frequency synthesizer developed and engineered through KENWOOD's elaborate VHF technology to provide high performance and outstanding technical characteristics.

The TR-7400A is capable of transmitting or receiving F3 FM signals on up to 800 Channels at intervals of 5 kHz, having 25W RF output power.

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# SPECIFICATIONS

## GENERAL

|                              |  |    |
|------------------------------|--|----|
| <b>Semiconductors</b>        | Transistors  | 58 |
|                              | FETs   | 8  |
|                              | ICs  | 19 |
|                              | Diodes   | 63 |
| <b>Frequency Range</b>       | 144.00 to 147.995 MHz  |    |
| <b>Frequency Synthesizer</b> | Digital (TTL Logic) control of phase locked VCO  |    |
| <b>Synthesizer Stability</b> | Less than $\pm 750$ Hz at $25^{\circ}\text{C}$   |    |
| <b>Mode</b>                  | FM   |    |
| <b>Number of Channel</b>     | 800  |    |
| <b>Operating Temperature</b> | $-20$ to $+50^{\circ}\text{C}$   |    |
| <b>Power Voltage</b>         | 11.5 VDC to 16.0 VDC<br>(13.8 VDC as reference)  |    |
| <b>Grounding</b>             | Negative grounding   |    |
| <b>Antenna Impedance</b>     | 50 $\Omega$  |    |
| <b>DC Current</b>            | Less than 1A in receive with no input signal<br>Less than 8A in transmit (HI)<br>Less than 4.5A in transmit (LOW)<br>(at 13.8 VDC) |    |
| <b>Dimension</b>             | 182 mm (7-3/16") wide<br>74 mm (2-7/8") high<br>270 mm (10-5/8") deep  |    |
| <b>Weight</b>                | Approx. 2.8 kg (6.2 lbs.)  |    |

## TRANSMIT SECTION

|                                   |  |   |
|-----------------------------------|--|---|
| <b>RF Output Power</b>            | High   | 25 watts (min.)                             |
|                                   | Low  | approx. 5 watts (adjustable up to 15 watts) |
| <b>Modulation</b>                 | Variable reactance direct shift                  |   |
| <b>Max. Frequency Deviation</b>   | $\pm 5$ kHz                                      |   |
| <b>Spurious Radiation</b>         | Less than $-60$ dB                               |   |
| <b>Touch Tone Input Impedance</b> | 600 $\Omega$                                     |   |
| <b>Microphone</b>                 | Dynamic microphone with PTT switch, 500 $\Omega$ |   |

## RECEIVE SECTION

|                               |   |          |
|-------------------------------|---|----------|
| <b>Circuitry</b>              | Double superheterodyne  |          |
| <b>Intermediate Frequency</b> | 1st IF  | 10.7 MHz |
|                               | 2nd IF  | 455 kHz  |
| <b>Sensitivity</b>            | Less than 0.4 $\mu\text{V}$ for 20 dB quieting<br>(Less than 1 $\mu\text{V}$ for 30 dB S/N) |          |
| <b>Squelch Sensitivity</b>    | Less than 0.25 $\mu\text{V}$  |          |
| <b>Pass Band Width</b>        | More than 12 kHz at 6 dB down   |          |
| <b>Selectivity (2 Signal)</b> | More than 72 dB at 30 kHz of adjacent channel   |          |
| <b>Image Rejection</b>        | More than 70 dB   |          |
| <b>Spurious Interference</b>  | More than 60 dB   |          |
| <b>Intermodulation</b>        | More than 66 dB   |          |
| <b>Audio Output</b>           | More than 1.5 watts across 8 $\Omega$ load (10% distortion)                                 |          |

## OPTION

|                                      |                             |
|--------------------------------------|-----------------------------|
| <b>i) Tone Squelch</b>               |                             |
| <b>Tone Deviation</b>                | $\pm 0.5$ kHz (adjusted)    |
| <b>Encoder Response</b>              | Less than 0.5 sec.          |
| <b>Frequency Stability</b>           | Less than $\pm 1\%$         |
| <b>Tone Squelch Open Sensitivity</b> | Less than SINAD 10 dB       |
| <b>Tone Distortion</b>               | Less than 5%                |
| <b>ii) Tone Burst</b>                |                             |
| <b>Burst Time</b>                    | Approx. 0.5 sec. (adjusted) |

**NOTE:** The circuit and ratings may change without notice due to development in technology.

## Final Transistor (2N6083) Specifications

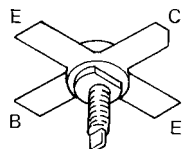
Maximum Ratings  $T_A = 25^\circ\text{C}$  (Unless otherwise specified)

| Item    | $V_{CB0}$ | $V_{CE0}$ | $V_{EB0}$ | $I_C$ | $P_D$                         | Stud torque | $T_{stg}$        |
|---------|-----------|-----------|-----------|-------|-------------------------------|-------------|------------------|
| Unit    | V         | V         | V         | A     | $T_A = 75^\circ\text{C}$<br>W | in lb       | $^\circ\text{C}$ |
| Ratings | 36        | 18        | 4         | 4     | 65                            | 6.5         | -65 to 200       |

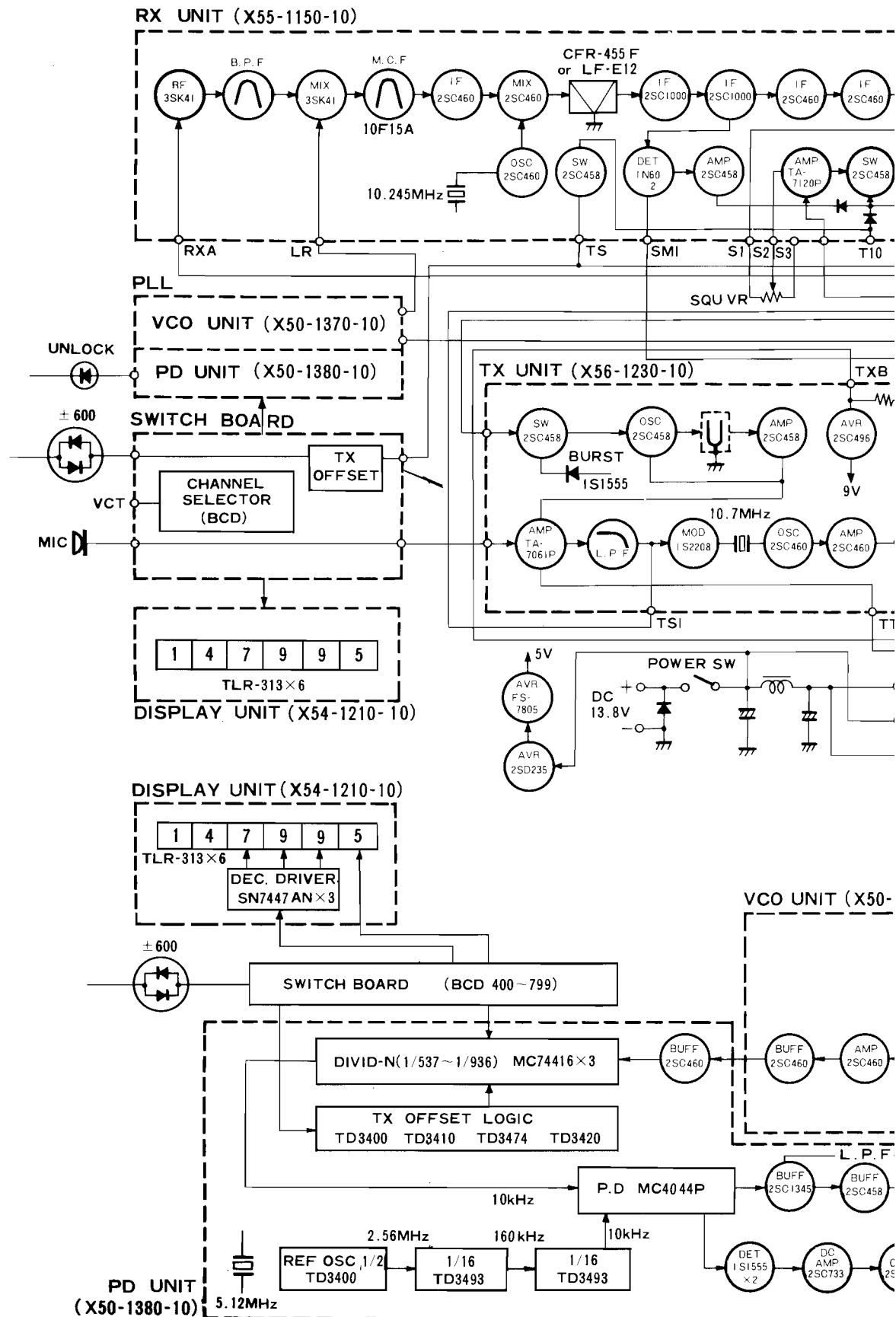
Characteristics Standard  $T_A = 25^\circ\text{C}$  (Unless otherwise specified.)

| Symbol     | Condition   | Standard value |         | Unit | LTPD level |   |
|------------|---|----------------|---------|------|------------|---|
|            |   | Minimum        | Maximum |      |            |   |
| $I_{CBO}$  | $V_{CB} = 15\text{ V}$  |                | 1.0     | mA   | 5          | 1 |
| $BV_{CES}$ | $I_C = 15\text{ mA}$  | 36             |         | V    | 5          | 1 |
| $BV_{CEO}$ | $I_C = 100\text{ mA}$   | 18             |         | V    | 5          | 1 |
| $BV_{EBO}$ | $I_E = 5\text{ mA}$   | 4              |         | V    | 5          | 1 |
| $h_{FE}$   | $V_{CE} = 5\text{ V}, I_C = 1\text{ A}$                                 | 5              |         |      | 5          | 1 |
| $C_{ob}$   | $V_{CB} = 15\text{ V}, f = 0.1\text{ MHz}$                              |                | 130     | pF   | 10         | 1 |
| $G_{PE}$   | $V_{CC} = 12.5\text{ V}, P_{OUT} = 30\text{ W}$<br>$f = 175\text{ MHz}$ | 5.7            |         | dB   | 10         | 1 |
| $\eta$     | $V_{CC} = 12.5\text{ V}, P_{OUT} = 30\text{ W}$<br>$f = 175\text{ MHz}$ | 65             |         | %    | 10         | 1 |
| $I_{CES}$  | $V_{CE} = 15\text{ V}, T_C = 55^\circ\text{C}$                          |                | 10      | mA   | 5          | 1 |

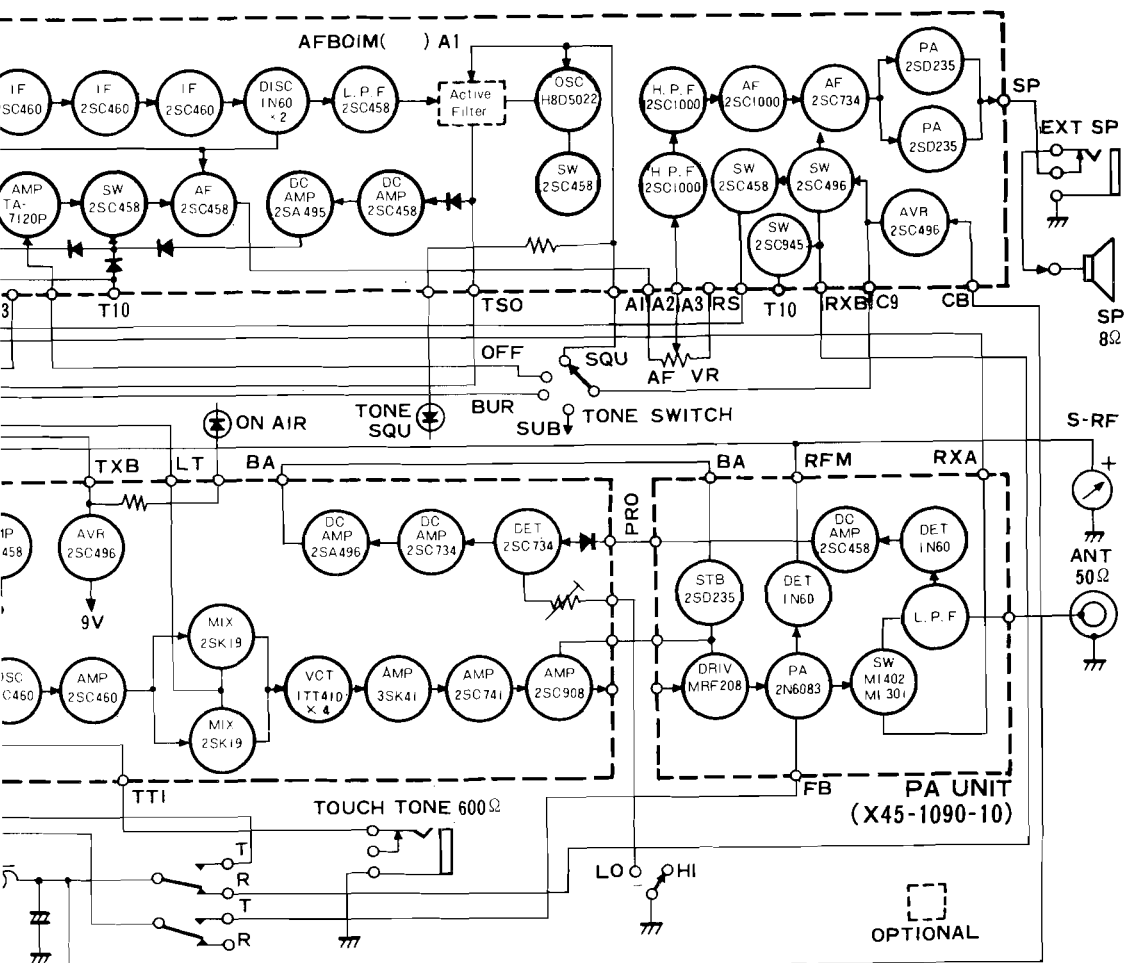
2N6083



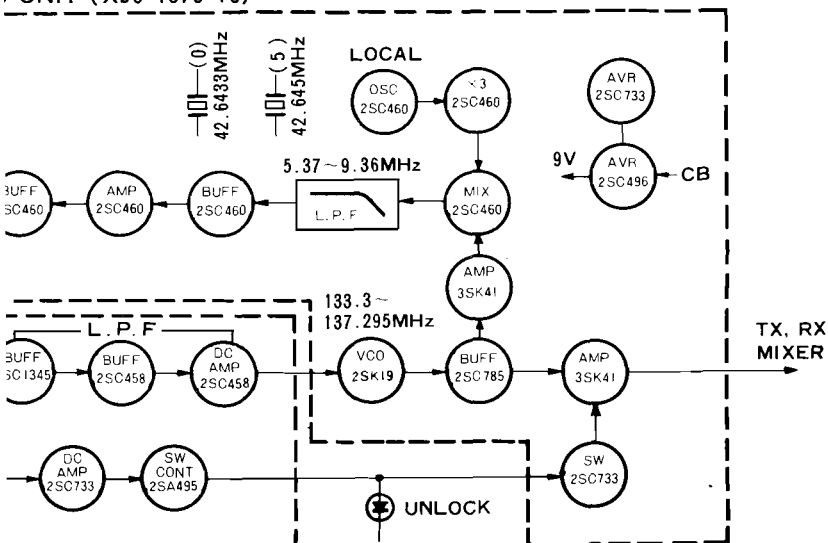
# BLOCK DIAGRAM



# DIAGRAM



## UNIT (X50-1370-10)



The block diagram of the TR-7400A is shown in page 5.

The TR-7400A incorporates newly developed circuit techniques such as a PLL frequency synthesizer as the local oscillator.

## PLL CIRCUIT

The block diagram is given in Fig. 1.

The circuit is outlined below. The outputs of the VCO and LOCAL OSC are mixed together and converted to 5.37 ~ 9.36 MHz signal and divided to 1/537 ~ 1/936 with the programmable counter to obtain a 10 kHz output. The phases between the 10 kHz output and another 10 kHz signal obtained by demultiplying 5.12 MHz REF OSC output to 1/512, are compared. And the phase difference, if any, is fed back to the VCO to lock it. The stability of this function is determined by the LOCAL OSC and REF OSC, and the stability of the VCO is virtually equal to that of a crystal oscillator.

Fig. 2 shows the frequency relationship of the system.  $\Delta f_r$  and  $\Delta f_l$  are the frequency deviations of the REF OSC and LOCAL OSC respectively. You will see how the VCO frequency changes with the deviations and N preset in the programmable counter.

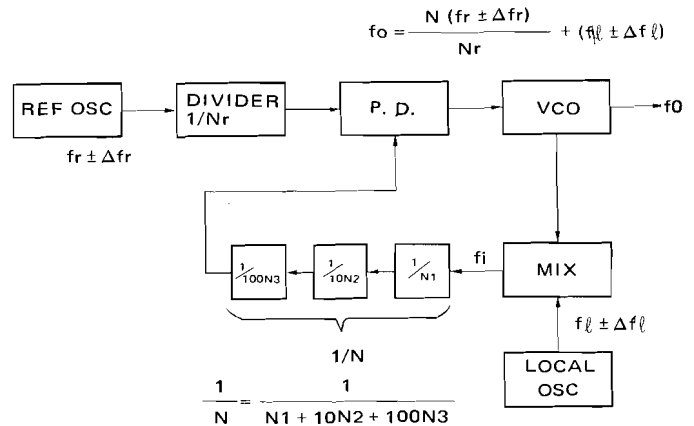


Fig. 2 Frequency Relationship of PLL SYSTEM

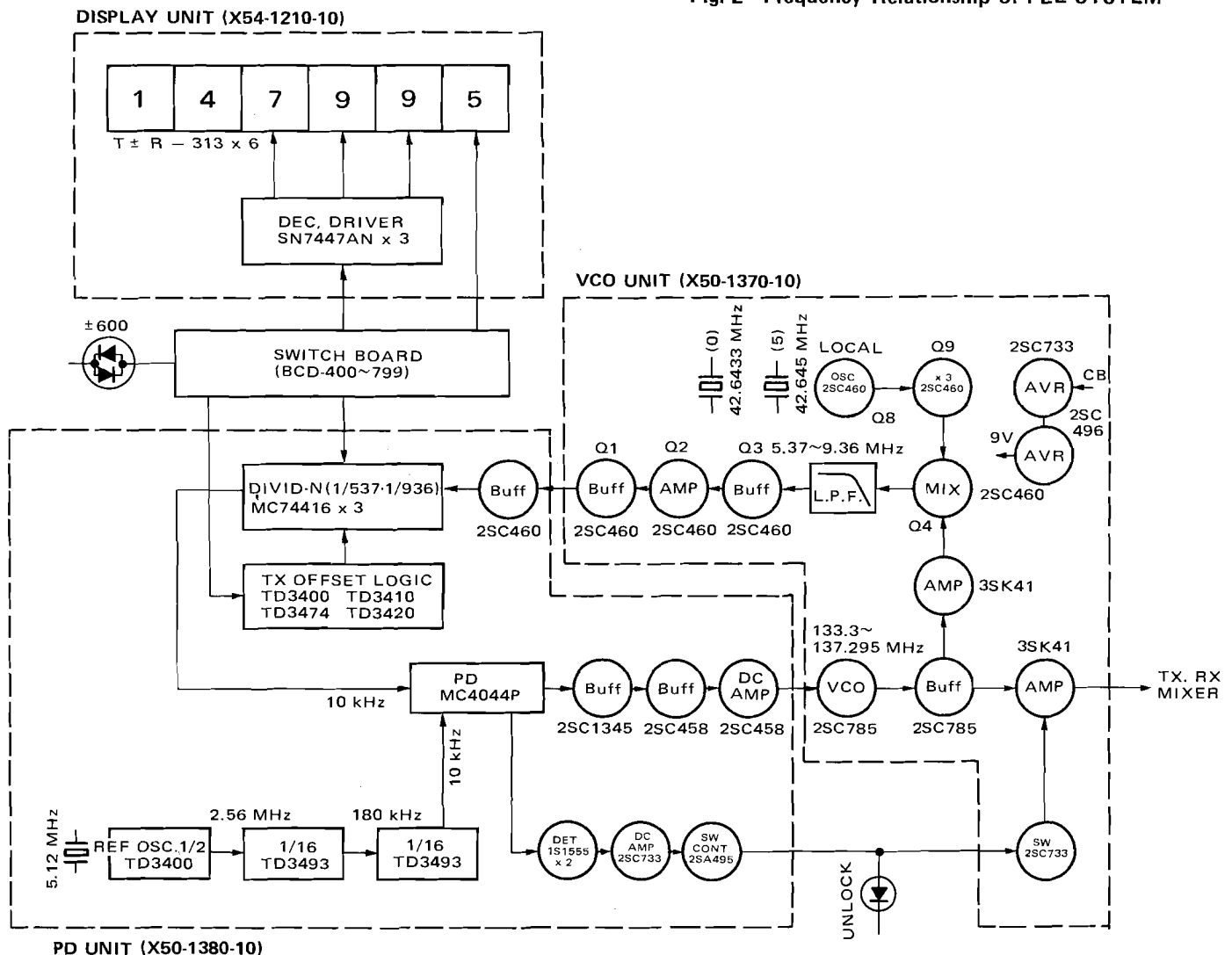


Fig. 1 PLL Circuit Block Diagram

## VCO UNIT (X50-1370-10)

The VCO is a Colpitts type oscillating circuit (Q7) and its frequency varies with the control voltage applied to varicap diode D1. This circuit is strictly stabilized against changes in temperature and power source voltage to improve the C/N of its output and prevent unlocking. The VCO's output is passed through buffer Q6, amplified by Q12 and applied to MIX through D6 and D7 for both reception and transmission.

In the LOCAL OSC, two quartz crystals for 0 and 5 kHz are switched with a switching diode. Q8 performs overtone oscillation and its output is tripled in Q9 to 127.930 and 127.935 MHz which are applied to MIX stage. The MIX circuit mixes the output and the VCO's output amplified by Q5, and its output is passed through a  $\pi$ -type LPF to deliver IF output of 5.37 ~ 9.36 MHz.

The output is amplified by the wide-band amplifier of Q1 to Q3 and applied to the programmable counter. Q13, which turns on and off VCO amp Q12, is a protective circuit in order to prevent emission of spurious radiation occurring when the PLL circuit fails to lock and the VCO runs away. This circuit is automatically reset when the PLL begins to work properly because it is not involved in the phase lock loop. D8 provides a certain time delay when Q13 is turned off, so Q13 does not operate during the transient state before the VCO is locked, though the indicator works. This contributes to reduce noise.

## PD UNIT (X50-1380-10)

Q6 serves as the interface and buffer amp for IC8. The waveform of its IF output is shaped in IC8 and its output frequency is divided to 10 kHz by the programmable counter consisting of IC5 to 12 and the resulting signal is applied to MC4044P of IC4. While IC1 generates 5.12 MHz signal which is divided to 1/2 by the flip-flop circuit involved in IC1. The resulting frequency is further divided to 1/16 in IC2, IC3 and 10-kHz output signal is applied to MC4044P of IC4.

The MC4044P consists of two PDs (phase detectors), charge pump and amplifier. Fig. 3 shows the block diagram. Passing through the charge pump and active filter, the output of No. 1 PD becomes the control voltage to be applied to the varicap of the VCO. The active filter consists of Q1 to 3 to keep the VCO away from phase comparator noise. No. 1 PD, a digital phase comparator, contains a sequential logic circuit which operates at the edge of decay of signal coming to enter R and V terminal. Its state becomes as shown in Fig. 2 after a certain time. When R is not equal to V (unlocked state), D1 or D2 is turned on and Q5 turns on Q4 to switch off Q13, VCO amp driver, so that spurious emission which might occur if the PLL fails to lock is prevented.

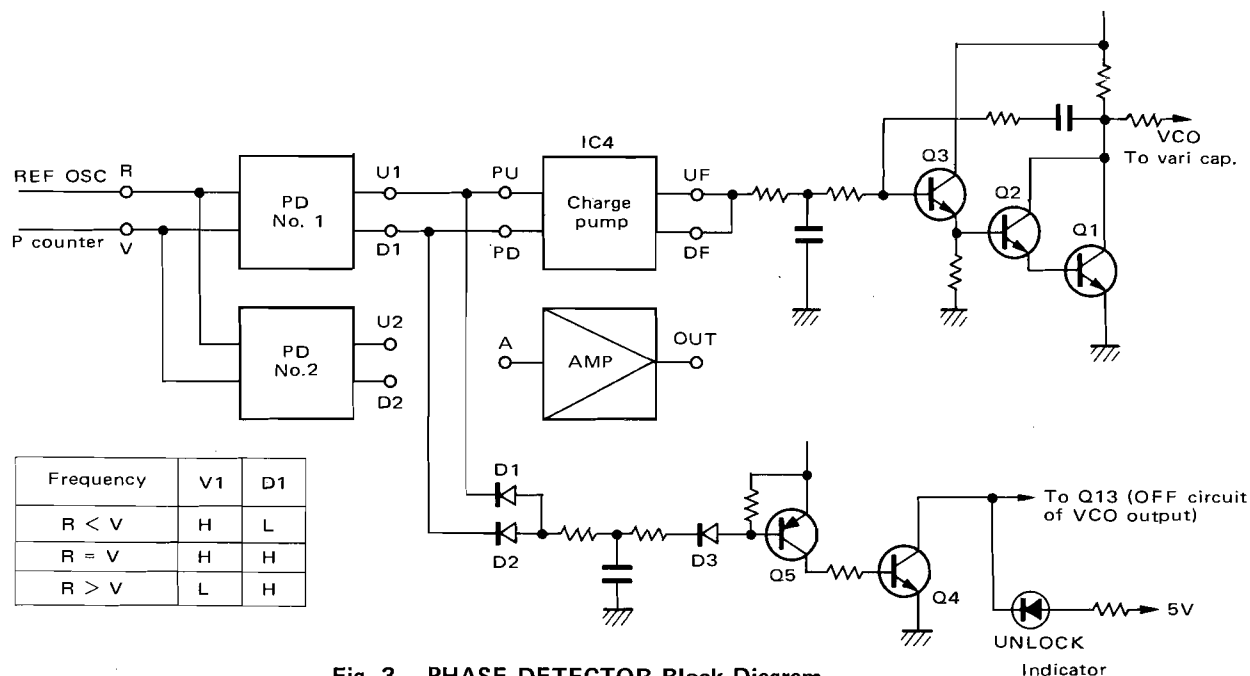


Fig. 3 PHASE DETECTOR Block Diagram



# CIRCUIT DESCRIPTION

## PROGRAMMABLE COUNTER AND TX-OFFSET CIRCUITS

These circuits, consisting of IC5 to IC12, are basically a MODULO-N PROGRAMMABLE counter of IC5 to IC7 added with an EXTENDER consisting of a D-flip-flop of IC10 and a logic circuit of IC8, 9, 11 and 12. It belongs to the high-speed scaling method. Fig. 4 shows the operation of the circuits. The operation is simply described below. A division ratio is preset in the MC74416 of IC5 to IC7 with a BCD code. The division ratio preset lies between 400 and 799 in relation to digital indication (144.00 ~ 147.99). While, since the IF signal entering the MC 74416 is 5.37 ~ 9.36 MHz to eliminate beat interference in reception, the division ratio must be 537 ~ 936 actually. For this purpose the gate, No, serves to raise the division ratio by 137. The gate circuit, U and D, shifts frequency by  $\pm 600$  kHz for repeater operation which is equivalent to the division ratio of  $137 \pm 60$ . MC74416 is a decrement-

ing counter which counts in the order of 0, 4, 3, 2, 1, 0 (5), 4, 3, ..... receiving input pulses, assuming that preset value is 5 and PE is "0" (L level).

But output becomes "1" (H level) only when the count is 0. It means that five input pulses make one output pulse and the frequency is divided to 1/5. With three ICs connected in cascade, the division ratio can be raised up to 999. IC10 is a high speed D-flip-flop which improves the operating frequency of MC74416, 8 MHz (min.), by a factor of two or more with the aid of gates A and B.

Fig. 4 shows the case where the least significant digit of the actual division ratio,  $N_s$ , is 7. Although resetting should be done at the rise of input pulse and presetting should be done at the decay of the input pulse when the count has become three, the level at A is set to L at the count of five and it becomes the output of IC10-1 at the next pulse. This output (Q1) resets the MC74416 and presets it to N at the same time, but counting is not performed since PE remains at the L level during the next

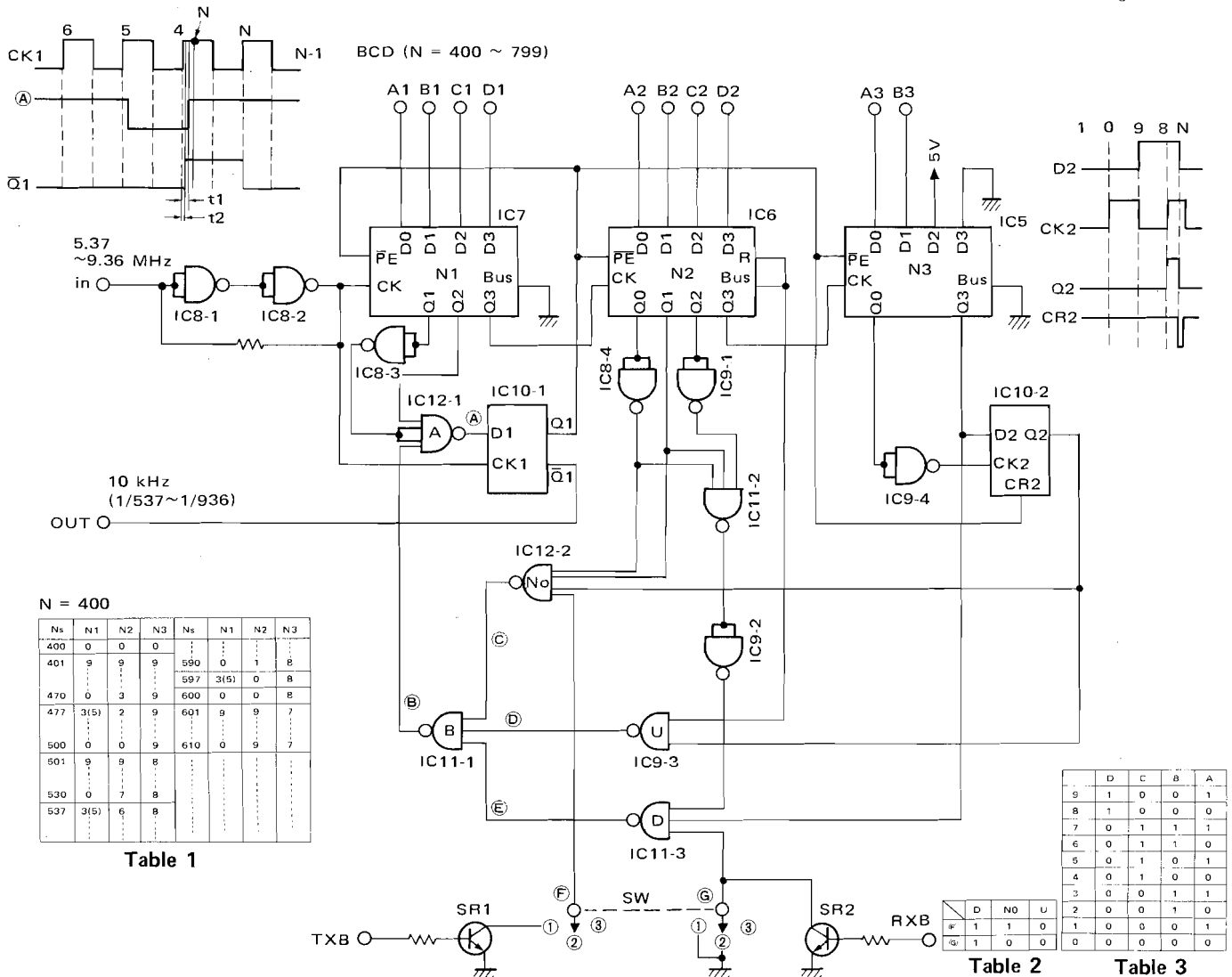


Fig. 4 Block Diagram of PROGRAMMABLE COUNTER and TX-OFFSET Circuit

## CIRCUIT DESCRIPTIONS

input pulse and it is reset. The operating frequency has been improved because resetting and presetting are done in one cycle of input pulse but not in half a cycle, and the delay time,  $t_2$ , of the high speed D-flip-flop in IC10 is much smaller than the delay time,  $t_1$ , from IC5, 6 and 7 and logic circuit to point A.

Next, operation is explained in relation to the TX offset switch setting.

1 +600

During reception, this is the same as in (2). During transmission, SR1 is turned on and becomes U in Table 2. Gate U therefore opens and gates No and D are closed. At this setting,  $N_s = N + 197$  ( $137 + 60$ ), and it operates as an extender when IC5, IC6 and IC7 take code 8, 0 and 5 respectively, to perform division of  $N + 197$ .

2 No (SIMP)

(F) and (G) make up No in Table 2. Gates No and U open and gate D is closed. At this setting, the relation,  $N_s = N + 137$ , holds between preset value N and actual division ratio  $N_s$ . It is enough to decrement the counter after division of N (decrementing) has completed and perform resetting and presetting just when the count has become 137. For this purpose, IC5, IC6 and IC7 do not take code 8, 6 and 3 respectively (as already described), but it operates as an extender at code 5 and performs division of  $N + 137$ . Since the gate is of code 197 ( $137 + 60$ ), the extender operates before this code triggers the circuitry.

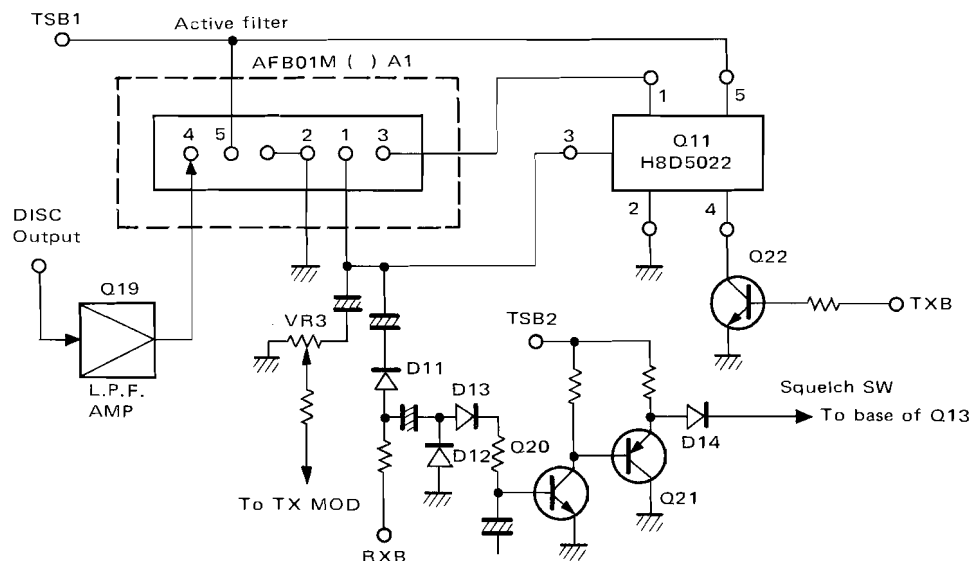
3 -600

During reception, SR2 is turned on as in (2). During transmission, gates No, U and D open as D in Table 2. At this setting,  $N_s = N + 77$  ( $137 - 60$ ), it operates as an extender to perform division of  $N + 77$  when IC5, IC6 and IC7 carry code 9, 2 and 5 respectively. At this time, the extender operates at code 77 even when all gates are open.

Table 1 shows the case of  $N = 400$  (144.00 MHz).

## TONE SQUELCH CIRCUIT

Fig. 5 shows the circuit. The tone squelch circuit employed in this equipment is the so-called CTCSS (continuous tone controlled squelch system). Tone signal of a certain frequency is superimposed with audio signal at the transmission side, which is separated at the reception side to drive the squelch circuit. When set to SQU (tone squelch) as shown in Fig. 5, a voltage is applied to TSB1 and TSB2. When no signal is received or signal received does not have tone component, Q20 and 21 remain off and no sound is reproduced since the voltage of TSB2 is applied to the base of Q13 through D14 and the AF circuit is turned off. When signal including tone component is received, the tone signal separated from discriminator output with Q19, LPF and amplifier, is applied to an active filter. The active filter which serves to the tone frequency and Q11 give steep characteristics at the frequency. It selects tone output equal to the active filter and its output passes through D11 (on during reception) and is detected in D12 and 13. It turns on Q20 and then Q21 and turns off Q13 and the AF circuit (Q14) operates to reproduce sound from speaker. In the AF circuit, an active type high-pass filter of Q24 and 25 cuts off tone signal output to amplify audio signal alone. During transmission, Q22 is turned on, and the active filter and Q11 form an oscillating circuit to deliver output with the same frequency as of the active filter. This output is passed through VR3 and modulated in TX unit together with audiosignal. The maximum frequency deviation for audio signal is  $\pm 5$  kHz and that for tone component for tone squelch is  $\pm 0.5$  kHz, which results in a ratio of about  $-20$  dB. This would result in buzzing sound when unmodulated signal is received, but a high-pass filter of 300 Hz in cutoff frequency incorporated in the equipment reduces the tone level to prevent buzz. Operation is the same even in the SUB (sub-audible) since a voltage is applied to TSB1, and sub-audible control is performed.



**Fig. 5 TONE SQUELCH Circuit**

# CIRCUIT DESCRIPTION

**Table 4 Squelch Active Filter List**

| Frequency (Hz) | Parts number |
|----------------|--------------|
| 88.5           | L79-0408-05  |
| 94.8           | L79-0409-05  |
| 100.0          | L79-0410-05  |
| 103.5          | L79-0411-05  |
| 107.2          | L79-0412-05  |
| 110.9          | L79-0413-05  |
| 114.8          | L79-0414-05  |
| 118.8          | L79-0415-05  |
| 128.0          | L79-0416-05  |
| 127.3          | L79-0417-05  |
| 131.8          | L79-0418-05  |
| 136.5          | L79-0419-05  |
| 141.3          | L79-0420-05  |
| 146.2          | L79-0421-05  |
| 151.4          | L79-0422-05  |
| 156.7          | L79-0423-05  |

## VCT CIRCUIT

The equipment incorporates a VCT circuit at the output side of the transmission mixer to improve spurious radiation and output levels in the wide range from 144 to 148 MHz. Varicaps D2, 3 and 4 are connected to tuning coils L11, 12 and 13 through temperature compensation capacitors. Voltages divided from common 9V (C9) with R62 and 61 (145.5 MHz), VR61 (144.5 MHz) VR62 (146.5 MHz) and VR63 (147.5 MHz) and switched with the MHz switch are applied to D2, 3 and 4.

## FINAL CIRCUIT

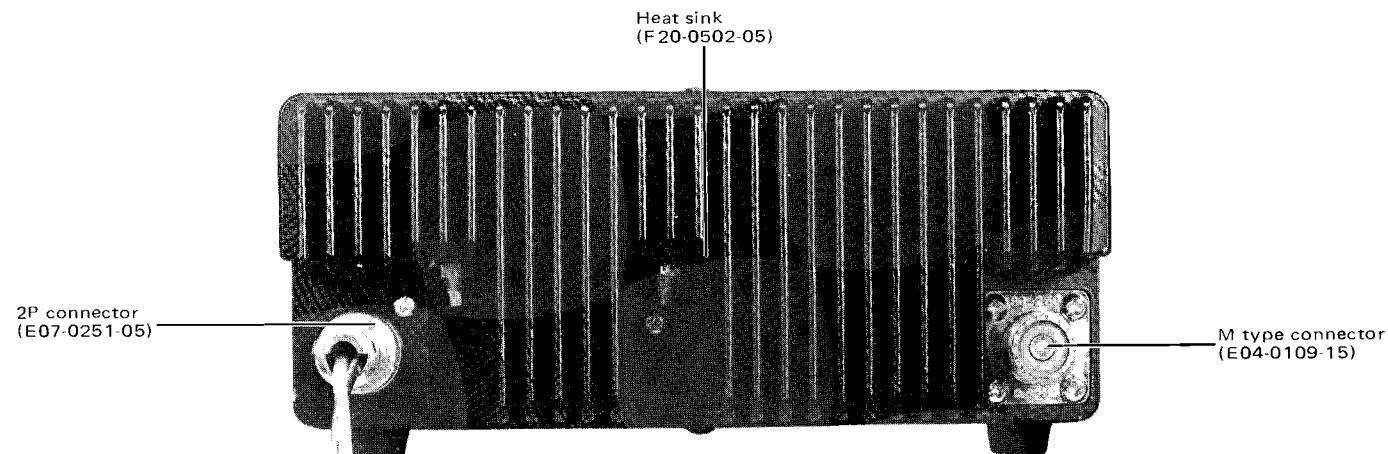
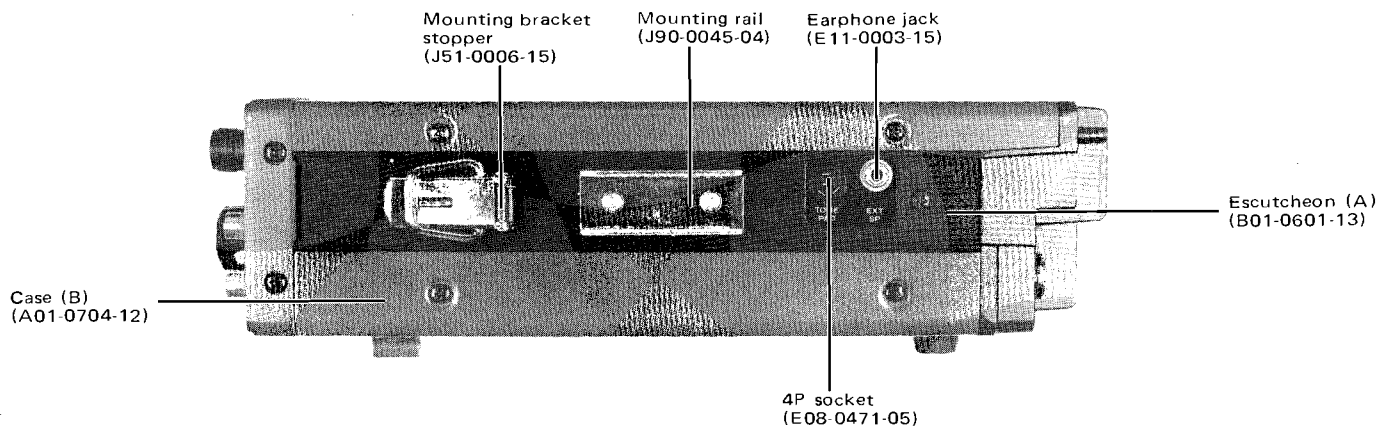
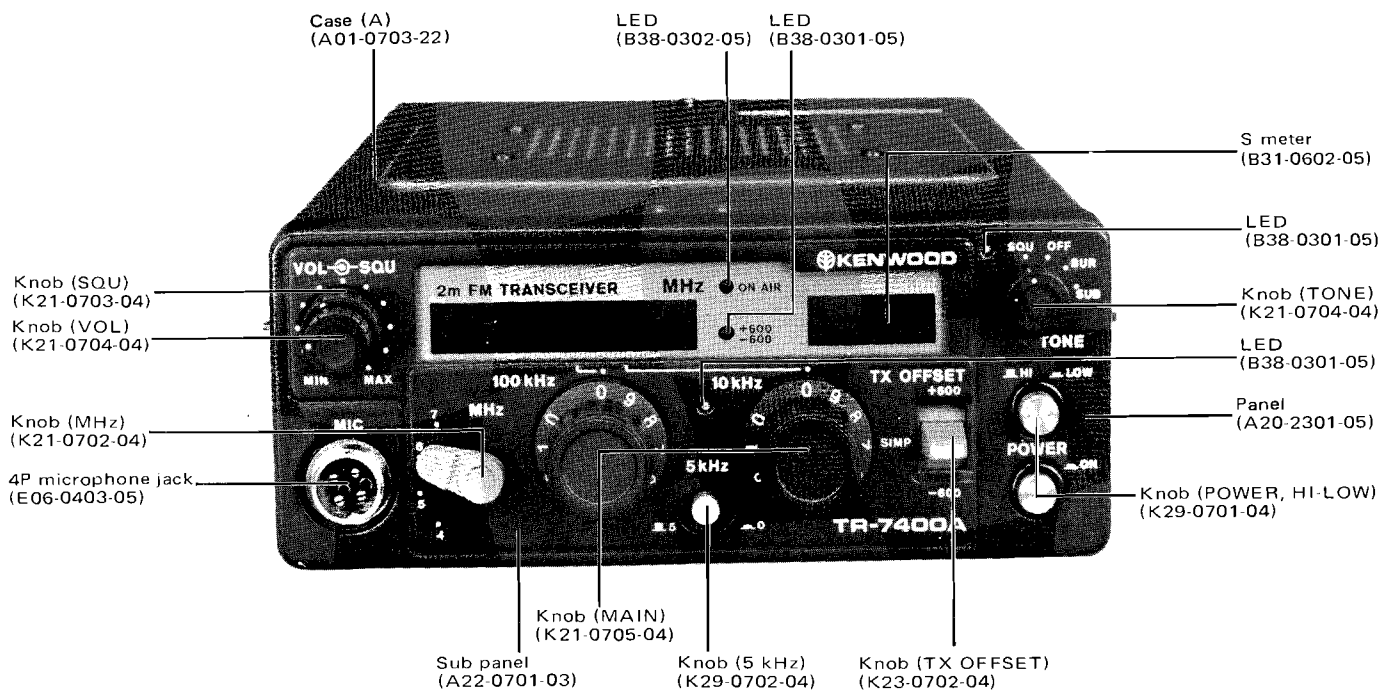
The output of the TX unit (about 1.4 W, 50-ohm load) is amplified to about 10 W (50-ohm load) by Q1 of the PA unit and to about 35 W (50-ohm load) by Q2 and delivered to the ANT terminal by way of an ANT switching diode and a LPF. To protect the final transistor (Q2), the input power to Q2 is limited by controlling the collector voltage of the driver (Q15 of TX unit and Q1 of PA unit) by detecting SWR of antenna with Q3, 10 and 11. When power is low, the circuit is used to reduce the voltage across the SB terminal with VR5.

Large aluminum die-cast heat sinks in combination with Motorola transistors, MRF208 and 2N6083, ensure high reliability.

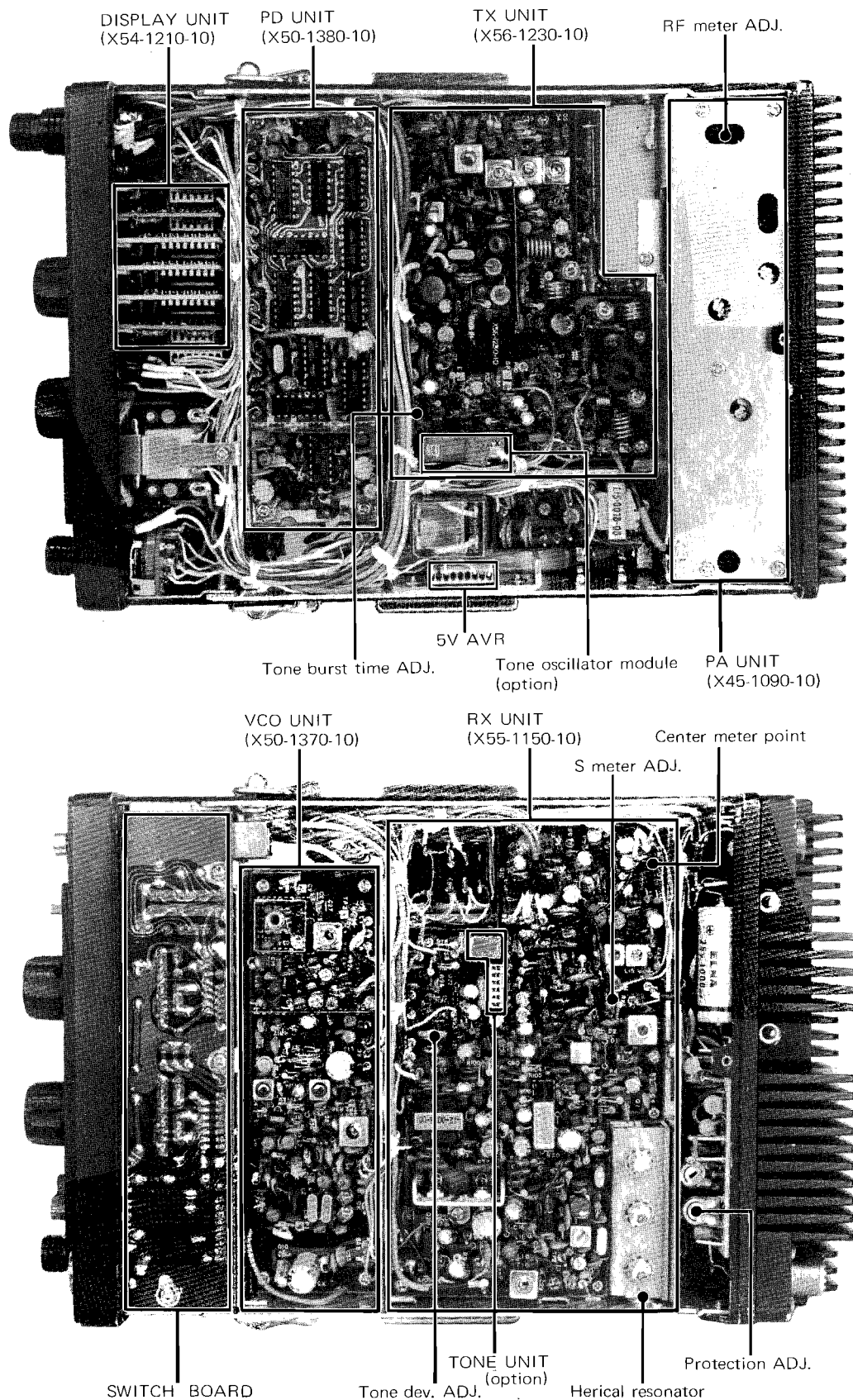
**Table 5 Tone Burst Oscillator  
Module List**

| Frequency (Hz) | Parts number |
|----------------|--------------|
| 1800           | TBM-1800     |
| 1950           | TBM-1950     |
| 2000           | TBM-2000     |
| 2100           | TBM-2100     |
| 2150           | TBM-2150     |
| 2200           | TBM-2200     |
| 2250           | TBM-2250     |
| 2400           | TBM-2400     |
| 2550           | TBM-2550     |

# PARTS ALIGNMENT

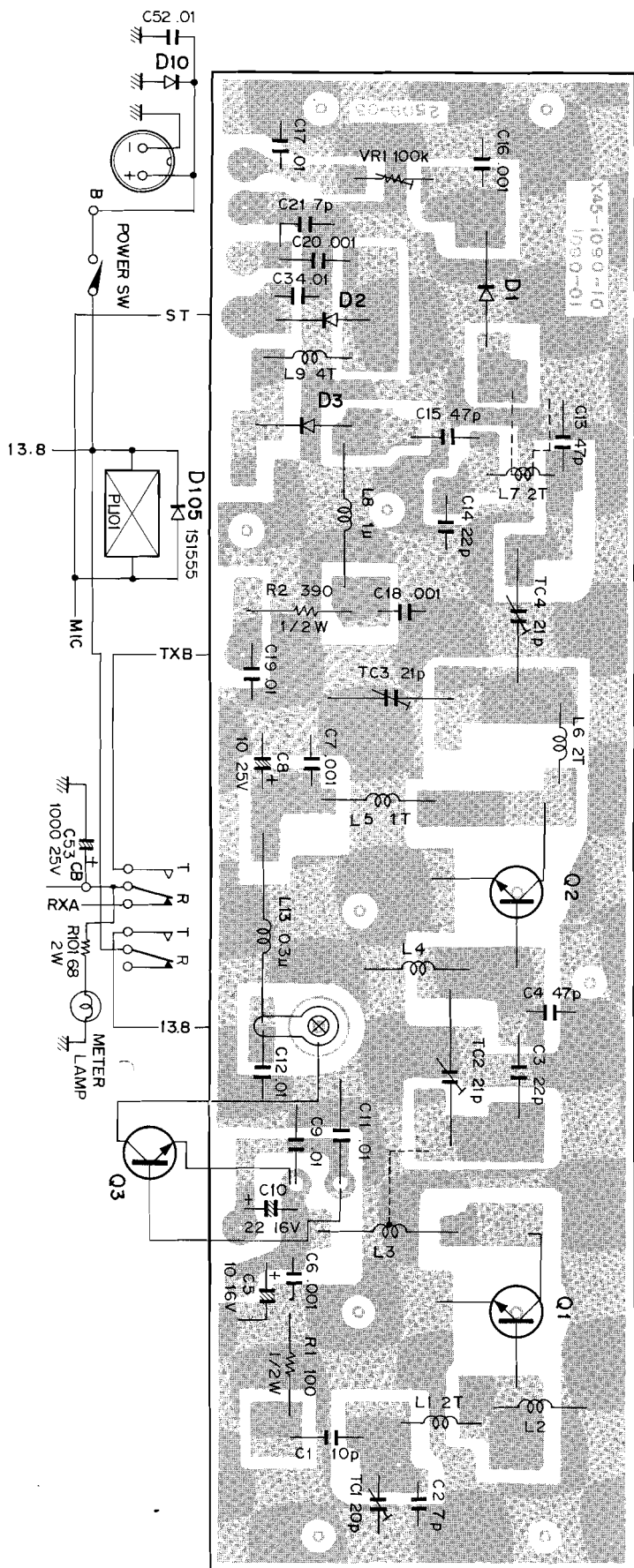


# PARTS ALIGNMENT

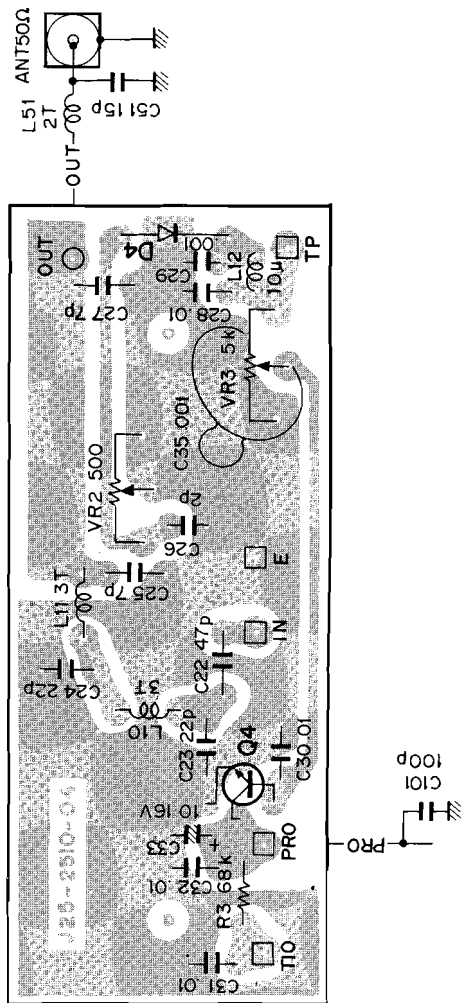
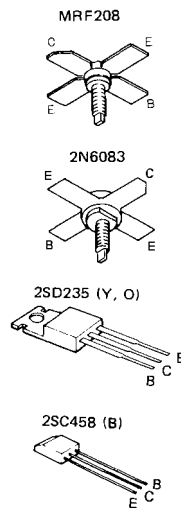


# PC BOARD

## ▼ PA UNIT (X45-1090-10)

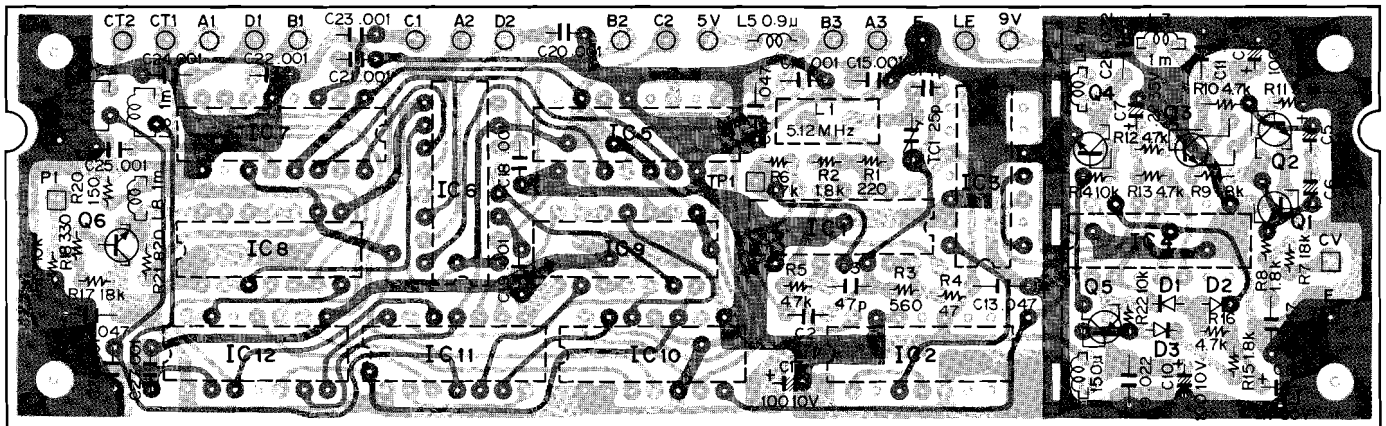


Q1:MRF208, Q2:2N6083, Q3:2SD235 (Y, O),  
Q4:2SC458 (B), D1, 4:1N60, D2:M1301,  
D3:M1402, D10:SR3AM-2



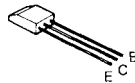
# PC BOARD

## ▼ PD UNIT (X50-1380-10)

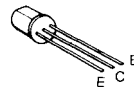


Q1, 2:2SC458 (B), Q3:2SC1345 (E), Q4:2SC733 (Y), Q5:2SA495 (Y), Q6:2SC460 (B), IC1, 8, 9:TD3400AP, IC2, 3:TD3493BP, IC4:MC4044P, IC5~7:MC74416P, IC10:TD3474AP, IC11:TD3410AP, IC12:TD3420AP, D1~3:1S1555

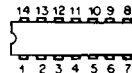
2SC460 (B)  
2SC458 (B)  
2SC1345 (E)



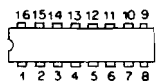
2SC733 (Y)  
2SA495 (Y)



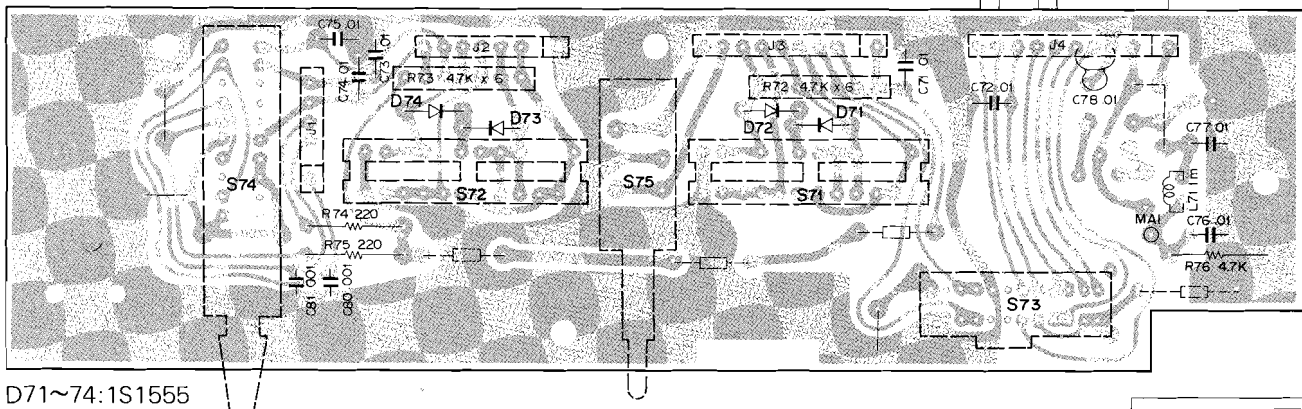
TD3400AP TD3474AP  
TD3410AP TD3493BP  
TD3420AP MC4044P



MC74416P

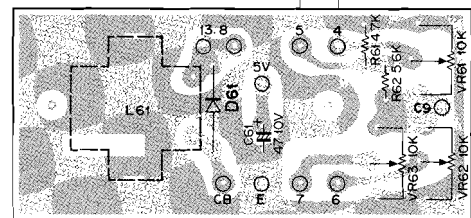


## ▼ PC BOARD FOR SWITCH (J25-2506-13)



D71~74:1S1555

## PC BOARD FOR CHOKE (J25-2507-04) ►

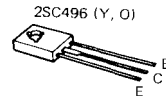
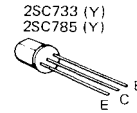
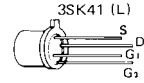
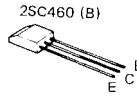
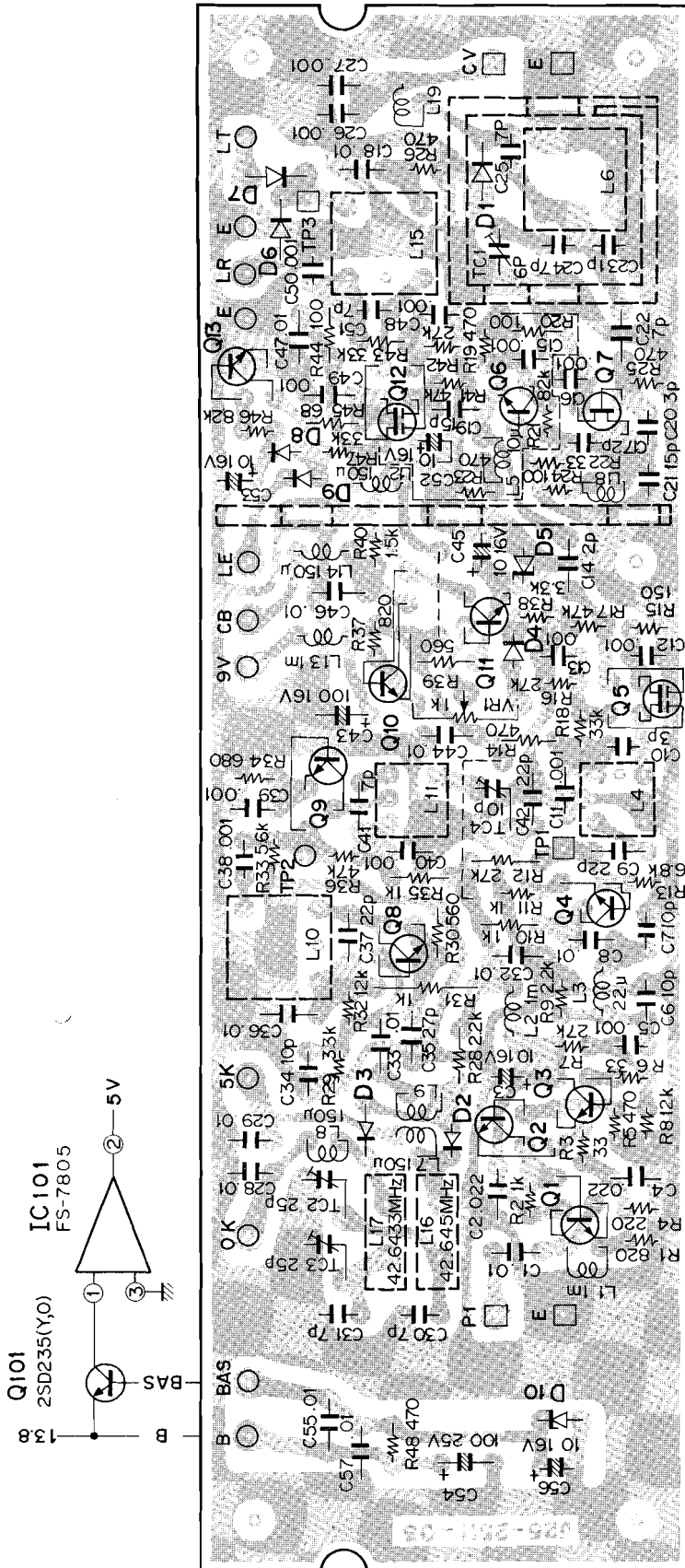


D61:V06B



# PC BOARD

▼ VCO UNIT (X50-1370-10)

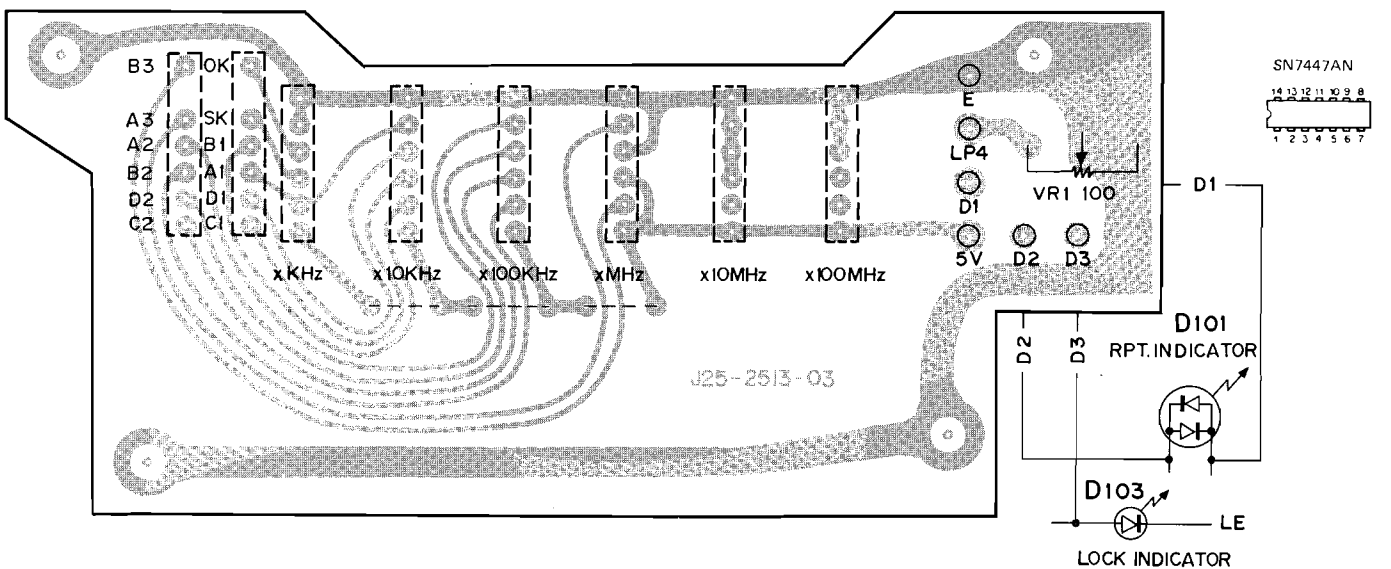
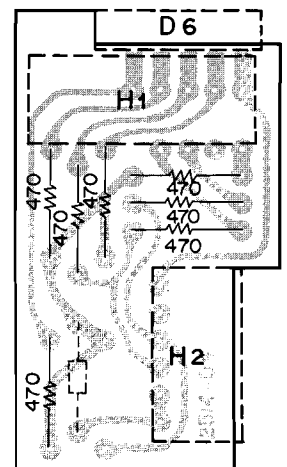
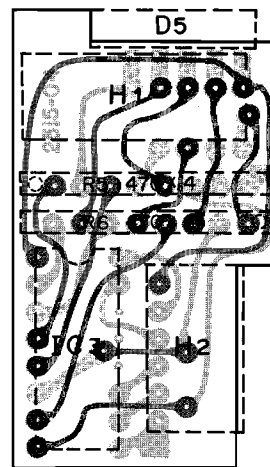
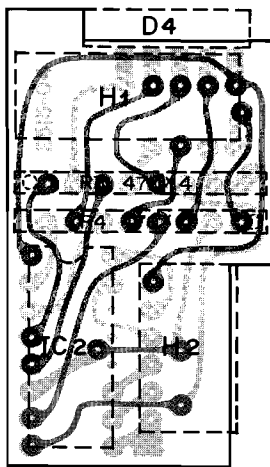
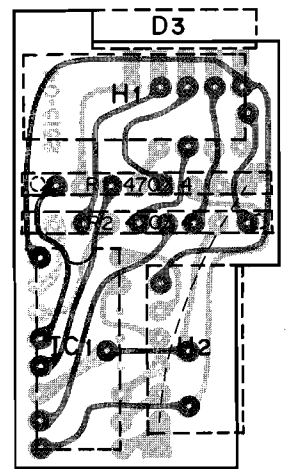
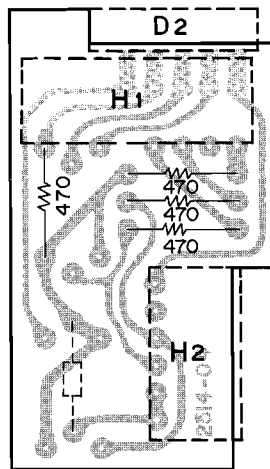
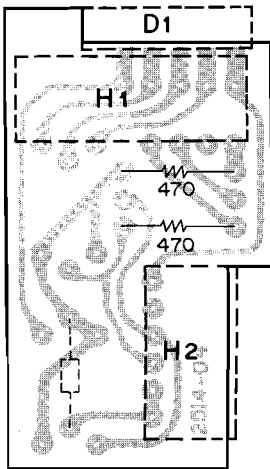


Q1~4, 8, 9:2SC460 (B), Q5, 12:3SK41 (L), Q6, 7:2SC785 (Y), Q10:2SC496 (Y, O), Q11, 13:2SC733 (Y),  
D1:1S2094, D2, 3, 6, 7:1S2588, D4, 8, 9:1S1555, D5:WZ-061, D10:WZ-090



# PC BOARD

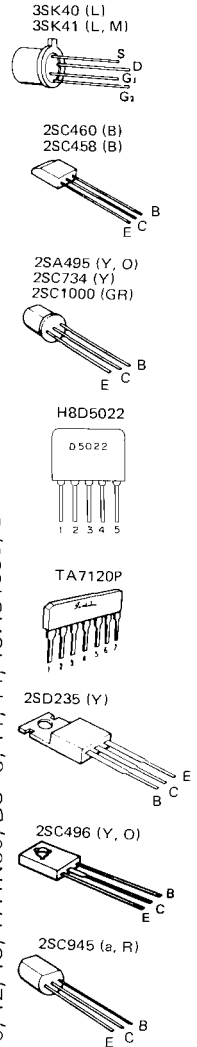
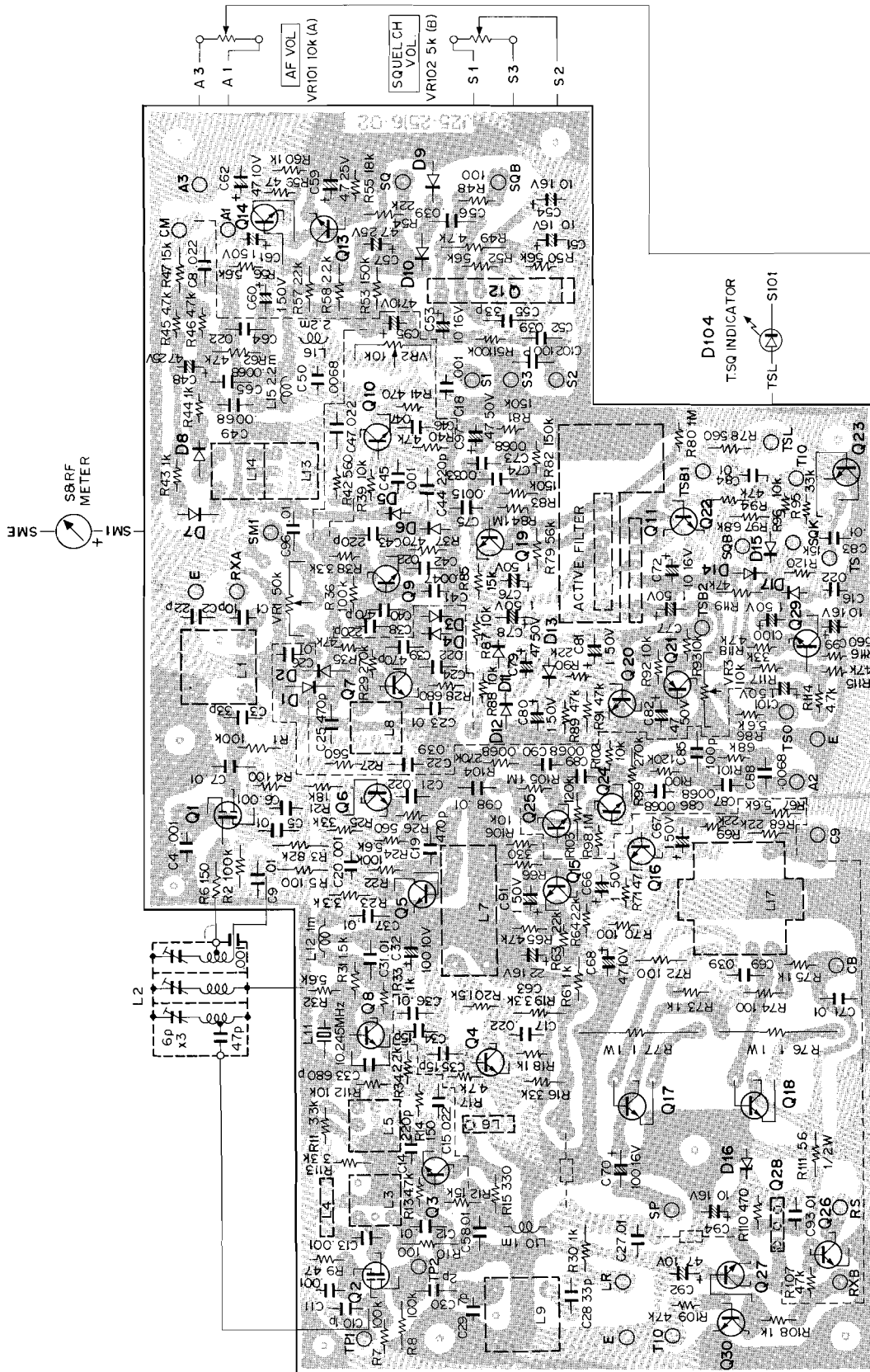
## ▼ INDICATOR UNIT (X54-1210-10)



IC1~3:SN7447AN, D1~6:TLR-313 (C, D)

# PC BOARD

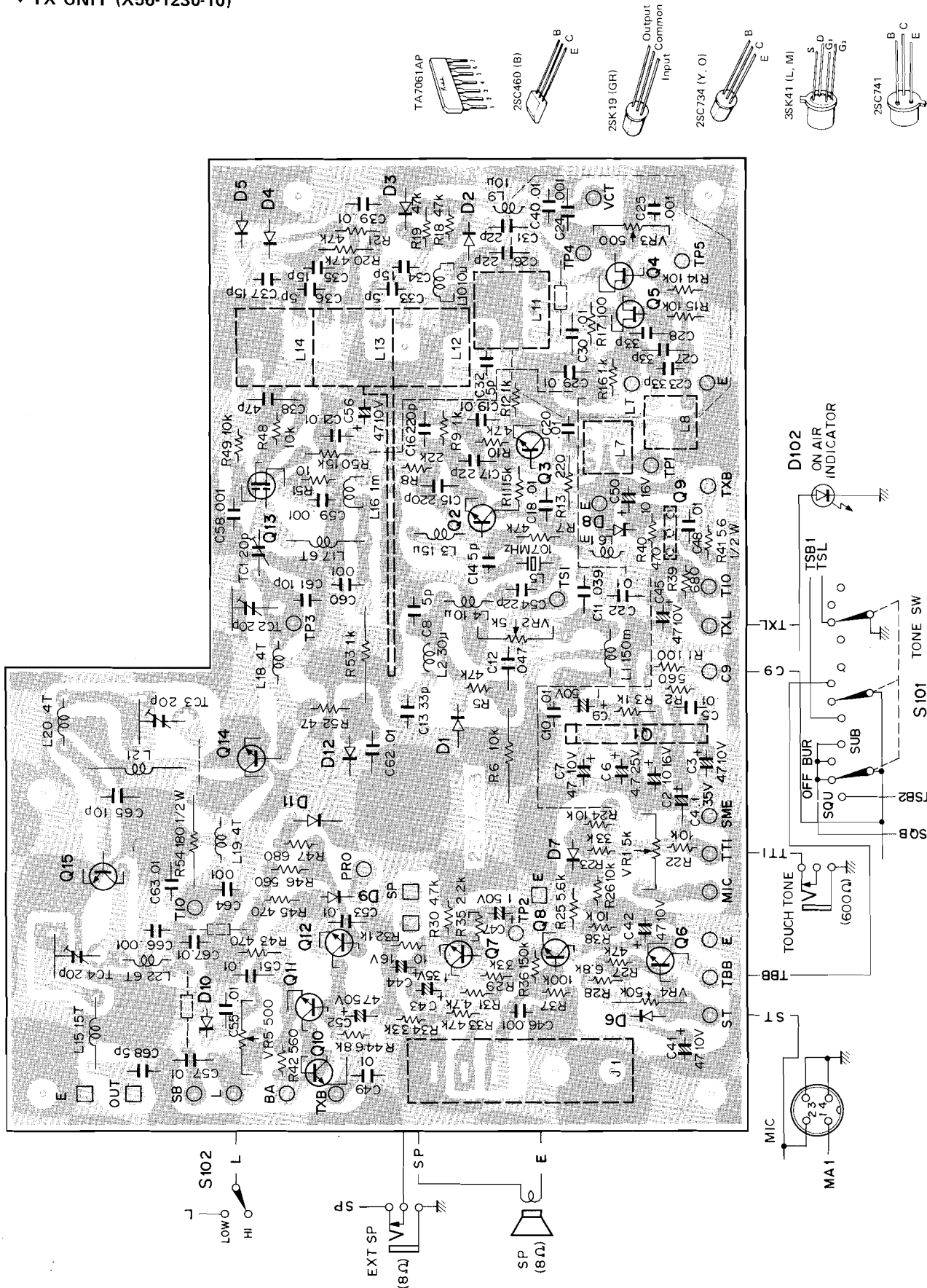
## ▼ RX UNIT (X55-1150-10)



Q1:3SK40 (L), Q2:3SK41 (L, M), Q3, 4, 7~10:2SC460 (B), Q5, 6, 15, 24, 25:2SC1000 (GR), Q11:H8D5022,  
 Q12:TA7120P, Q13, 14, 19, 20, 22, 23, 26, 29:2SC458 (B), Q16:2SC734 (Y), Q17, 18:2SD235 (Y), Q21:2SA495 (Y, O),  
 Q27, 28:2SC496 (Y, O), Q30:2SC945 (GR), D1, 2, 7~10, 12, 13, 17:1N60, D3~6, 11, 14, 15:1S1555, D16:WZ-090

# PC BOARD

## ▼ TX UNIT (X56-1230-10)



# PARTS LIST

TOTAL

☆ : New parts

| Ref. No.             | Parts No.    | Description                        | Re-<br>marks |
|----------------------|--------------|------------------------------------|--------------|
| <b>CAPACITOR</b>     |              |                                    |              |
| C61                  | CE04W1A470   | Electrolytic 47 $\mu$ F 10WV       |              |
| C71~78               | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20%    |              |
| C80, 81              | CK45D1H102M  | Ceramic 1000pF $\pm$ 20%           |              |
| C82                  | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20%    |              |
| C101                 | CC45SL1H101K | Ceramic 100pF $\pm$ 10%            |              |
| <b>RESISTOR</b>      |              |                                    |              |
| R61                  | RD14CY2E472J | Carbon 4.7k $\Omega$ $\pm$ 5% 1/4W |              |
| R62                  | RD14CY2E562J | Carbon 5.6k $\Omega$ $\pm$ 5% 1/4W |              |
| R72, 73              | R90-0113-06  | Resistor Block (4.7k $\Omega$ x 6) |              |
| R74, 75              | RD14BY2E221J | Carbon 220 $\Omega$ $\pm$ 5% 1/4W  |              |
| R76                  | RD14BY2E472J | Carbon 4.7k $\Omega$ $\pm$ 5% 1/4W |              |
| R101                 | RS14AB3D680J | Metal film 68 $\Omega$ $\pm$ 5% 2W |              |
| <b>SEMICONDUCTOR</b> |              |                                    |              |
| Q101                 | V04-0046-05  | Transistor 2SD235 (Y, O)           |              |
| IC101                | V30-0158-05  | IC FS-7805                         | ☆            |
| D61                  | V11-0219-05  | Diode V06B                         |              |
| D71~74               | V11-0076-05  | Diode 1S1555                       |              |
| D101                 | B38-0301-05  | LED with holder                    | ☆            |
| D102~104             | B38-0302-05  | LED with holder                    | ☆            |
| D105                 | V11-0076-05  | Diode 1S1555                       |              |
| <b>POTENTIOMETER</b> |              |                                    |              |
| VR61~63              | R12-3025-05  | Semi-fixed resistor 10k $\Omega$   |              |
| VR101,102            | R19-9401-05  | Variable resistor                  | ☆            |
| <b>SWITCH/RELAY</b>  |              |                                    |              |
| S71, 72              | S29-2401-05  | Rotary switch (CHANNEL)            | ☆            |
| S73                  | S29-0402-05  | Rotary switch (MHZ)                | ☆            |
| S74                  | S33-4401-05  | Lever switch (TX OFFSET)           | ☆            |
| S75                  | S40-2059-05  | Push switch (5 kHz)                |              |
| S101                 | S29-0401-05  | Rotary switch (TONE)               | ☆            |
| S102                 | S40-2060-05  | Push switch (HI-LOW)               |              |
| S103                 | S59-2029-05  | Push switch (POWER)                |              |
| RL101                | S51-2012-05  | Relay                              |              |
| <b>COIL</b>          |              |                                    |              |
| L61                  | L15-0016-05  | Choke coil (Low frequency)         |              |
| L71                  | L40-1021-03  | Ferri inductor 1mH                 |              |
| <b>MISCELLANEOUS</b> |              |                                    |              |
| —                    | A01-0703-02  | Case (A)                           | ☆            |
| —                    | A01-0704-12  | Case (B)                           | ☆            |
| —                    | A10-1201-32  | Chassis                            | ☆            |
| —                    | A20-2301-05  | Panel                              | ☆            |
| —                    | A22-0701-03  | Sub panel                          | ☆            |
| —                    | —            | —                                  | ☆            |
| —                    | B01-0601-13  | Escutcheon(A) (Right toward you)   | ☆            |
| —                    | B01-0602-03  | Escutcheon(B) (Left toward you)    | ☆            |
| —                    | B05-0701-04  | Speaker grille cloth               | ☆            |
| —                    | B10-0601-14  | Front glass                        | ☆            |
| —                    | B31-0602-05  | S meter                            | ☆            |
| —                    | B40-2403-04  | Model name plate                   | ☆            |
| —                    | B41-0605-04  | Name plate (terminal)              | ☆            |
| —                    | B42-1602-04  | Label                              | ☆            |
| —                    | B46-0058-00  | Warranty card                      |              |
| —                    | B50-2515-00  | Operating manual                   | ☆            |
| —                    | E06-0403-05  | 4P microphone jack                 |              |
| —                    | E07-0251-05  | 2P connector (plug)                | ☆            |
| —                    | E08-0471-05  | 4P socket                          | ☆            |
| —                    | E09-0471-05  | 4P plug                            | ☆            |
| —                    | E11-0003-15  | Phone jack                         |              |
| —                    | E12-0001-05  | Phone plug                         |              |

| Ref. No. | Parts No.   | Description                             | Re-<br>marks |
|----------|-------------|---|--------------|
| —        | E18-0802-05 | Relay socket                            |              |
| —        | E22-0207-05 | Lug                                     |              |
| —        | E23-0047-04 | Terminal x 11                           |              |
| —        | E30-0355-05 | Wire (for speaker)                      |              |
| —        | E31-0403-05 | Connector with lead                     | ☆            |
| —        | E31-0404-15 | Connector with lead                     | ☆            |
| —        | E31-0405-05 | Connector with lead                     | ☆            |
| —        | E31-0406-05 | Connector with lead                     | ☆            |
| —        | E31-0407-05 | Connector with lead                     | ☆            |
| —        | E31-0408-05 | Connector with lead                     | ☆            |
| —        | E31-0409-05 | Connector with lead                     | ☆            |
| —        | E40-0513-05 | Mini connector wafer                    |              |
| —        | E40-0616-05 | Mini connector housing x 2 Tone filter  |              |
| —        | E40-0713-05 | Mini connector wafer                    |              |
| —        | E40-0913-05 | Mini connector wafer                    |              |
| —        | E40-1013-05 | Mini connector wafer                    |              |
| —        | —           | —                                       |              |
| —        | F05-1031-05 | Fuse (10A) x 2                          |              |
| —        | F19-0601-14 | Blinding plate A (Inside)               | ☆            |
| —        | F19-0602-04 | Blinding plate B (Outside)              | ☆            |
| —        | F20-0078-05 | Insulating plate                        |              |
| —        | F29-0014-05 | Insulating washer                       |              |
| —        | —           | —                                       |              |
| —        | G11-0008-04 | Cushion                                 |              |
| —        | G11-0604-04 | Cushion                                 | ☆            |
| —        | G13-0014-04 | Vibration protector (rubber)            |              |
| —        | —           | —                                       |              |
| —        | H01-2510-03 | Case (inside)                           | ☆            |
| —        | H10-1206-14 | Buffer fixture                          |              |
| —        | H10-2501-03 | Styrene foam cushion (Upper)            | ☆            |
| —        | H10-2502-02 | Styrene foam cushion (Lower)            | ☆            |
| —        | H20-1401-13 | Protection cover                        | ☆            |
| —        | H25-0029-04 | Polyethylene bag (60 x 110 mm)          |              |
| —        | H25-0079-04 | Polyethylene bag (200 x 200 mm)         |              |
| —        | H25-0103-04 | Polyethylene bag (125 x 250 mm)         |              |
| —        | —           | —                                       |              |
| —        | J01-0021-04 | Leg                                     |              |
| —        | J02-0069-05 | Leg (rubber) x 2                        |              |
| —        | J13-0029-05 | Fuse holder                             |              |
| —        | J21-0941-02 | Mounting bracket                        |              |
| —        | J25-2506-13 | PC board (for switch)                   | ☆            |
| —        | J25-2507-04 | PC board (for choke)                    | ☆            |
| —        | J25-2508-04 | PC board (for TS)                       | ☆            |
| —        | J32-0029-04 | Hexagonal boss x 3 (PC board for choke) |              |
| —        | J32-0217-04 | Hexagonal boss x 4 (PLL)                |              |
| —        | J32-0704-04 | Hexagonal boss x 5 (for S74)            | ☆            |
| —        | J41-0020-04 | Knob bushing x 2                        |              |
| —        | J51-0006-15 | Mounting bracket stopper x 2            |              |
| —        | J90-0045-04 | Mounting rail x 2                       |              |
| —        | —           | —                                       |              |
| —        | K21-0702-04 | Knob (MHZ)                              |              |
| —        | K21-0703-04 | Knob (SQ)                               |              |
| —        | K21-0704-04 | Knob (AF, TONE) x 2                     |              |
| —        | K21-0705-04 | Knob (MAIN) x 2                         |              |
| —        | K23-0702-04 | Knob (TX OFFSET)                        |              |
| —        | K29-0701-04 | Knob (HI-LOW, POWER) x 2                |              |
| —        | K29-0702-04 | Knob (5 kHz)                            |              |
| —        | —           | —                                       |              |
| —        | T03-0027-15 | Speaker                                 |              |
| —        | T31-0302-05 | Microphone                              |              |
| —        | —           | —                                       |              |
| —        | X45-1090-10 | PA unit                                 | ☆            |
| —        | X50-1370-10 | VCO unit                                | ☆            |
| —        | X50-1380-10 | PD unit                                 | ☆            |
| —        | X54-1210-10 | Indicator unit                          | ☆            |
| —        | X55-1150-10 | RX unit                                 | ☆            |
| —        | X56-1230-10 | TX unit                                 | ☆            |

# PARTS LIST

## PA UNIT (X45-1090-10)

| Parts No.            | Ref. No.     | Description                               | Re-<br>marks |
|----------------------|--------------|---|--------------|
| <b>CAPACITOR</b>     |              |   |              |
| C1                   | CK45SL2H100D | Ceramic 10pF $\pm 0.5\text{pF}$           |              |
| C2                   | CK45SL2H070D | Ceramic 7pF $\pm 0.5\text{pF}$            |              |
| C3                   | CC45CH2H220J | Ceramic 22pF $\pm 5\%$                    |              |
| C4                   | CC45CH2H470K | Ceramic 47pF $\pm 10\%$                   |              |
| C5                   | CE04W1C100   | Electrolytic 10 $\mu\text{F}$ 16WV        |              |
| C6, 7                | CK45D1H102M  | Ceramic 1000pF $\pm 20\%$                 |              |
| C8                   | CE04W1E100   | Electrolytic 10 $\mu\text{F}$ 25WV        |              |
| C9                   | CK45F1H103Z  | Ceramic 0.01 $\mu\text{F}$ $+80\%, -20\%$ |              |
| C10                  | CE04W1C220   | Electrolytic 22 $\mu\text{F}$ 16WV        |              |
| C11, 12              | CK45F1H103Z  | Ceramic 0.01 $\mu\text{F}$ $+80\%, -20\%$ |              |
| C13                  | CC45SL2H470K | Ceramic 47pF $\pm 10\%$                   |              |
| C14                  | CC45SL2H220J | Ceramic 22pF $\pm 5\%$                    |              |
| C15                  | CC45SL2H470K | Ceramic 47pF $\pm 10\%$                   |              |
| C16                  | CK45D1H102M  | Ceramic 1000pF $\pm 20\%$                 |              |
| C17                  | CK45F1H103Z  | Ceramic 0.01 $\mu\text{F}$ $+80\%, -20\%$ |              |
| C18                  | CK45D1H102M  | Ceramic 1000pF $\pm 20\%$                 |              |
| C19                  | CK45F1H103Z  | Ceramic 0.01 $\mu\text{F}$ $+80\%, -20\%$ |              |
| C20                  | CK45D1H102M  | Ceramic 1000pF $\pm 20\%$                 |              |
| C21                  | CK45SL2H070D | Ceramic 7pF $\pm 0.5\text{pF}$            |              |
| C22                  | CK45SL2H470K | Ceramic 47pF $\pm 10\%$                   |              |
| C23, 24              | CK45SL2H220J | Ceramic 22pF $\pm 5\%$                    |              |
| C25                  | CK45SL2H070D | Ceramic 7pF $\pm 0.5\text{pF}$            |              |
| C26                  | CK45SL1H020C | Ceramic 2pF $\pm 0.25\text{pF}$           |              |
| C27                  | CK45SL2H070D | Ceramic 7pF $\pm 0.5\text{pF}$            |              |
| C28                  | CK45F1H103Z  | Ceramic 0.01 $\mu\text{F}$ $+80\%, -20\%$ |              |
| C29                  | CK45D1H102M  | Ceramic 1000pF $\pm 20\%$                 |              |
| C30~32               | CK45F1H103Z  | Ceramic 0.01 $\mu\text{F}$ $+80\%, -20\%$ |              |
| C33                  | CE04W1C100   | Electrolytic 10 $\mu\text{F}$ 10WV        |              |
| C34                  | CK45F1H103Z  | Ceramic 0.01 $\mu\text{F}$ $+80\%, -20\%$ |              |
| C35                  | CK45D1H102M  | Ceramic 1000pF $\pm 20\%$                 |              |
| C51                  | CK45SL2H150J | Ceramic 15pF $\pm 5\%$                    |              |
| C52                  | CK45F1H103Z  | Ceramic 0.01 $\mu\text{F}$ $+80\%, -20\%$ |              |
| C53                  | CE02W1E102   | Electrolytic 1000 $\mu\text{F}$ 25WV      |              |
| <b>RESISTOR</b>      |              |   |              |
| R1                   | RC05GF2H101J | Carbon 100 $\Omega$ $\pm 5\%$ 1/2W        |              |
| R2                   | RC05GF2H391J | Carbon 390 $\Omega$ $\pm 5\%$ 1/2W        |              |
| R3                   | RD14CY2E683J | Carbon 68k $\Omega$ $\pm 5\%$ 1/4W        |              |
| <b>POTENTIOMETER</b> |              |   |              |
| VR1                  | R12-5024-05  | Semi-fixed resistor 100k $\Omega$         |              |
| VR2                  | R12-0042-05  | Semi-fixed resistor 500 $\Omega$          |              |
| VR3                  | R12-2015-05  | Semi-fixed resistor 5k $\Omega$           |              |
| TC1                  | C05-0013-15  | Ceramic trimmer                           |              |
| TC2~4                | C02-0002-05  | Midget variable capacitor                 |              |
| <b>SEMICONDUCTOR</b> |              |   |              |
| Q1                   | V30-0224-05  | Transistor MRF208                         | ☆            |
| Q2                   | V30-0225-05  | Transistor 2N6083                         | ☆            |
| Q3                   | V04-0046-05  | Transistor 2SD235 (Y, O)                  |              |
| Q4                   | V03-0093-05  | Transistor 2SC458 (B)                     |              |
| D1                   | V11-0051-05  | Diode 1N60                                |              |
| D2                   | V11-0255-05  | Diode M1301                               |              |
| D3                   | V11-5260-16  | Diode M1402                               | ☆            |
| D4                   | V11-0051-05  | Diode 1N60                                |              |
| D10                  | V11-0171-05  | Diode SR3AM-2                             |              |

| Ref. No.             | Parts No.   | Description                     | Re-<br>marks |
|----------------------|-------------|---------------------------------|--------------|
| <b>COIL</b>          |             |                                 |              |
| L1                   | L34-0426-05 | VHF coil (6 $\phi$ 2T)          |              |
| L2                   | L33-0604-05 | Choke coil with 47 $\Omega$     | ☆            |
| L3                   | L34-0478-05 | VHF coil (8 $\phi$ 5T)          |              |
| L4                   | L33-0173-05 | Choke coil with 100 $\Omega$    |              |
| L5                   | L34-0605-05 | VHF coil (8 $\phi$ 1T)          | ☆            |
| L6                   | L34-0624-05 | VHF coil (8 $\phi$ 2T)          | ☆            |
| L7                   | L34-0604-05 | VHF coil (8 $\phi$ 2T)          | ☆            |
| L8                   | L33-0025-05 | Choke coil 1 $\mu\text{H}$      |              |
| L9                   | L34-0464-05 | VHF coil (6 $\phi$ 4T)          |              |
| L10, 11              | L34-0430-05 | VHF coil (6 $\phi$ 3T)          |              |
| L12                  | L40-1001-03 | Ferri-inductor (10 mH)          |              |
| L13                  | L33-0074-05 | Choke coil (0.3 $\mu\text{H}$ ) |              |
| L51                  | L34-0604-05 | VHF coil (8 $\phi$ 2T)          | ☆            |
| <b>MISCELLANEOUS</b> |             |                                 |              |
| —                    | E04-0109-15 | M type connector                |              |
| —                    | E06-0251-05 | 2P connector (jack)             | ☆            |
| —                    | E22-0207-05 | Lug                             |              |
| —                    | E23-0015-04 | Earth lug x 2                   |              |
| —                    | E23-0046-04 | Terminal x 12                   |              |
| —                    | E23-0047-04 | Terminal                        |              |
| —                    | E30-0234-15 | Lead wire                       |              |
| —                    | F20-0078-05 | Insulating plate                |              |
| —                    | F20-0502-05 | Heat sink                       | ☆            |
| —                    | J32-0703-14 | Hexagonal boss x 5              | ☆            |

## VCO UNIT (X50-1370-10)

| Ref. No.         | Parts No.    | Description                               | Re-<br>marks |
|------------------|--------------|---|--------------|
| <b>CAPACITOR</b> |              |   |              |
| C1               | CQ92M1H103K  | Mylar 0.01 $\mu\text{F}$ $\pm 10\%$       |              |
| C2               | CQ92M1H223K  | Mylar 0.022 $\mu\text{F}$ $\pm 10\%$      |              |
| C3               | CE04W1C100   | Electrolytic 10 $\mu\text{F}$ 16WV        |              |
| C4               | CQ92M1H223K  | Mylar 0.022 $\mu\text{F}$ $\pm 10\%$      |              |
| C5               | CQ92M1H102K  | Mylar 1000pF $\pm 10\%$                   |              |
| C6, 7            | CC45CH1H100D | Ceramic 10pF $\pm 0.5\text{pF}$           |              |
| C8               | CQ92M1H103K  | Mylar 0.01 $\mu\text{F}$ $\pm 10\%$       |              |
| C9               | CC45SL1H220J | Ceramic 22pF $\pm 5\%$                    |              |
| C10              | CC45TH1H030C | Ceramic 3pF $\pm 0.25\text{pF}$           |              |
| C11~13           | CK45D1H102M  | Ceramic 1000pF $\pm 20\%$                 |              |
| C14              | CC45SL1H020C | Ceramic 2pF $\pm 0.25\text{pF}$           |              |
| C15, 16          | CK45D1H102M  | Ceramic 1000pF $\pm 20\%$                 |              |
| C17              | CC45CH1H020C | Ceramic 2pF $\pm 0.25\text{pF}$           |              |
| C18              | CK45F1H103Z  | Ceramic 0.01 $\mu\text{F}$ $+80\%, -20\%$ |              |
| C19              | CC45SL1H150J | Ceramic 15pF $\pm 5\%$                    |              |
| C20              | CC45CH1H030C | Ceramic 3pF $\pm 0.25\text{pF}$           |              |
| C21              | CC45CH1H150J | Ceramic 15pF $\pm 5\%$                    |              |
| C22              | CC45RH1H070C | Ceramic 7pF $\pm 0.25\text{pF}$           |              |
| C23              | CC45TH1H010C | Ceramic 1pF $\pm 0.25\text{pF}$           |              |
| C24, 25          | CC45TH1H070D | Ceramic 7pF $\pm 0.5\text{pF}$            |              |
| C26, 27          | CK45B1H102K  | Ceramic 1000pF $\pm 10\%$                 |              |
| C28, 29          | CK45F1H103Z  | Ceramic 0.01 $\mu\text{F}$ $+80\%, -20\%$ |              |
| C30, 31          | CC45SL1H070D | Ceramic 7pF $\pm 0.5\text{pF}$            |              |
| C32, 33          | CK45F1H103Z  | Ceramic 0.01 $\mu\text{F}$ $+80\%, -20\%$ |              |
| C34              | CC45CH1H100D | Ceramic 10pF $\pm 0.5\text{pF}$           |              |
| C35              | CC45CH1H270J | Ceramic 27pF $\pm 5\%$                    |              |
| C36              | CK45F1H103Z  | Ceramic 0.01 $\mu\text{F}$ $+80\%, -20\%$ |              |
| C37              | CC45RH1H220J | Ceramic 22pF $\pm 5\%$                    |              |
| C38~40           | CK45D1H102M  | Ceramic 1000pF $\pm 20\%$                 |              |
| C41              | CC45RH1H070D | Ceramic 7pF $\pm 0.5\text{pF}$            |              |
| C42              | CC45SL1H220J | Ceramic 22pF $\pm 5\%$                    |              |
| C43              | CE04W1C101   | Electrolytic 100 $\mu\text{F}$ 16WV       |              |
| C44              | CK45F1H103Z  | Ceramic 0.01 $\mu\text{F}$ $+80\%, -20\%$ |              |
| C45              | CE04W1C100   | Electrolytic 10 $\mu\text{F}$ 16WV        |              |

# PARTS LIST

| Ref. No. | Parts No.    | Description               | Re-<br>marks |
|----------|--------------|---------------------------|--------------|
| C46, 47  | CK45F1H103Z  | Ceramic 0.01μF +80%, -20% |              |
| C48~50   | CK45D1H102M  | Ceramic 1000pF ±20%       |              |
| C51      | CC45RH1H070D | Ceramic 7pF ±0.5pF        |              |
| C52, 53  | CE04W1C100   | Electrolytic 10μF 16WV    |              |
| C54      | CE04W1E101   | Electrolytic 100μF 25WV   |              |
| C55      | CK45F1H103Z  | Ceramic 0.01μF +80%, -20% |              |
| C56      | CE04W1C100   | Electrolytic 10μF 16WV    |              |
| C57      | CK45F1H103Z  | Ceramic 0.01μF +80%, -20% |              |

## RESISTOR

|        |              |                       |  |
|--------|--------------|-----------------------|--|
| R1     | RD14CY2B821J | Carbon 820Ω ±5% 1/8W  |  |
| R2     | RD14CY2B102J | Carbon 1kΩ ±5% 1/8W   |  |
| R3     | RD14CY2B330J | Carbon 33Ω ±5% 1/8W   |  |
| R4     | RD14CY2B221J | Carbon 220Ω ±5% 1/8W  |  |
| R5     | RD14CY2B471J | Carbon 470Ω ±5% 1/8W  |  |
| R6     | RD14CY2B330J | Carbon 33Ω ±5% 1/8W   |  |
| R7     | RD14CY2B273J | Carbon 27kΩ ±5% 1/8W  |  |
| R8     | RD14CY2B123J | Carbon 12kΩ ±5% 1/8W  |  |
| R9     | RD14CY2B222J | Carbon 2.2kΩ ±5% 1/8W |  |
| R10,11 | RD14CY2B102J | Carbon 1kΩ ±5% 1/8W   |  |
| R12    | RD14CY2B273J | Carbon 27kΩ ±5% 1/8W  |  |
| R13    | RD14CY2B682J | Carbon 6.8kΩ ±5% 1/8W |  |
| R14    | RD14CY2B471J | Carbon 470Ω ±5% 1/8W  |  |
| R15    | RD14CY2B151J | Carbon 150Ω ±5% 1/8W  |  |
| R16    | RD14CY2B273J | Carbon 27kΩ ±5% 1/8W  |  |
| R17    | RD14CY2B473J | Carbon 47kΩ ±5% 1/8W  |  |
| R18    | RD14CY2B333J | Carbon 33kΩ ±5% 1/8W  |  |
| R19    | RD14CY2B471J | Carbon 470Ω ±5% 1/8W  |  |
| R20    | RD14CY2B101J | Carbon 100Ω ±5% 1/8W  |  |
| R21    | RD14CY2B823J | Carbon 82kΩ ±5% 1/8W  |  |
| R22    | RD14CY2B330J | Carbon 33Ω ±5% 1/8W   |  |
| R23    | RD14CY2B471J | Carbon 470Ω ±5% 1/8W  |  |
| R24    | RD14CY2B101J | Carbon 100Ω ±5% 1/8W  |  |
| R25    | RD14CY2E471J | Carbon 470Ω ±5% 1/4W  |  |
| R26    | RD14CY2B471J | Carbon 470Ω ±5% 1/8W  |  |
| R28    | RD14CY2B222J | Carbon 2.2kΩ ±5% 1/8W |  |
| R29    | RD14CY2B332J | Carbon 3.3kΩ ±5% 1/8W |  |
| R30    | RD14CY2B561J | Carbon 560Ω ±5% 1/8W  |  |
| R31    | RD14CY2B102J | Carbon 1kΩ ±5% 1/8W   |  |
| R32    | RD14CY2B123J | Carbon 12kΩ ±5% 1/8W  |  |
| R33    | RD14CY2B562J | Carbon 5.6kΩ ±5% 1/8W |  |
| R34    | RD14CY2B681J | Carbon 680Ω ±5% 1/8W  |  |
| R35    | RD14CY2B102J | Carbon 1kΩ ±5% 1/8W   |  |
| R36    | RD14CY2B473J | Carbon 47kΩ ±5% 1/8W  |  |
| R37    | RD14CY2B821J | Carbon 820Ω ±5% 1/8W  |  |
| R38    | RD14CY2B332J | Carbon 3.3kΩ ±5% 1/8W |  |
| R39    | RD14CY2B561J | Carbon 560Ω ±5% 1/8W  |  |
| R40    | RD14CY2B152J | Carbon 1.5kΩ ±5% 1/8W |  |
| R41    | RD14CY2B473J | Carbon 47kΩ ±5% 1/8W  |  |
| R42    | RD14CY2B273J | Carbon 27kΩ ±5% 1/8W  |  |
| R43    | RD14CY2B333J | Carbon 33kΩ ±5% 1/8W  |  |
| R44    | RD14CY2B101J | Carbon 100Ω ±5% 1/8W  |  |
| R45    | RD14CY2B680J | Carbon 68Ω ±5% 1/8W   |  |
| R46    | RD14CY2B822J | Carbon 8.2kΩ ±5% 1/8W |  |
| R47    | RD14CY2B333J | Carbon 33kΩ ±5% 1/8W  |  |
| R48    | RD14CY2E471J | Carbon 470Ω ±5% 1/4W  |  |

## POTENTIOMETER

|        |             |                         |  |
|--------|-------------|-------------------------|--|
| VR1    | R12-1020-05 | Semi-fixed resistor 1kΩ |  |
| TC1    | C05-0062-05 | Ceramic trimmer         |  |
| TC2, 3 | C05-0067-05 | Ceramic trimmer         |  |
| TC4    | C05-0031-15 | Ceramic trimmer         |  |

## SEMICONDUCTOR

|       |             |                       |  |
|-------|-------------|-----------------------|--|
| Q1~4  | V03-0079-05 | Transistor 2SC460 (B) |  |
| Q5    | V09-0057-05 | FET 3SK41 (L)         |  |
| Q6    | V03-0253-05 | Transistor 2SC785 (O) |  |
| Q7    | V09-0012-05 | FET 2SK19 (GR)        |  |
| Q8, 9 | V03-0079-05 | Transistor 2SC460 (B) |  |

| Ref. No. | Parts No.   | Description              | Re-<br>marks |
|----------|-------------|--------------------------|--------------|
| Q10      | V03-0336-05 | Transistor 2SC496 (Y, O) |              |
| Q11      | V03-0123-05 | Transistor 2SC733 (Y)    |              |
| Q12      | V09-0057-05 | FET 3SK41 (L)            |              |
| Q13      | V03-0123-05 | Transistor 2SC733 (Y)    |              |
| D1       | V11-0447-05 | Diode 1SV50S             | ☆            |
| D2, 3    | V11-0414-05 | Diode 1S2588             |              |
| D4       | V11-0076-05 | Diode 1S1555             |              |
| D5       | V11-0243-05 | Zener diode WZ-061       |              |
| D6, 7    | V11-0414-05 | Diode 1S2588             |              |
| D8, 9    | V11-0076-05 | Diode 1S1555             |              |
| D10      | V11-0240-05 | Zener diode WZ-090       |              |

## COIL/X'TAL

|         |             |                                |   |
|---------|-------------|--------------------------------|---|
| L1, 2   | L40-1021-03 | Ferri-inductor                 |   |
| L3      | L40-2201-03 | Ferri-inductor                 |   |
| L4      | L31-0347-05 | Tuning coil (for 135 MHz)      |   |
| L5      | L40-1001-03 | Ferri-inductor                 |   |
| L6      | L32-0601-05 | OSC coil (for VCO)             | ☆ |
| L7, 8   | L40-1511-03 | Ferri-inductor                 |   |
| L9      | L33-0605-05 | Choke coil 0.47μH              | ☆ |
| L10     | L32-0002-05 | OSC coil (for 42 MHz)          |   |
| L11     | L31-0347-05 | Tuning coil (for 135 MHz)      |   |
| L12     | L40-1511-03 | Ferri-inductor                 |   |
| L13     | L40-1021-03 | Ferri-inductor                 |   |
| L14     | L40-1511-03 | Ferri-inductor                 |   |
| L15     | L31-0180-05 | Tuning coil (for 135 MHz)      |   |
| L16     | L77-0712-05 | Crystal oscillator 42.645 MHz  | ☆ |
| L17     | L77-0711-05 | Crystal oscillator 42.6433 MHz | ☆ |
| L18, 19 | L40-3391-03 | Ferri-inductor                 |   |

## MISCELLANEOUS

|   |             |               |  |
|---|-------------|---------------|--|
| — | E23-0046-04 | Terminal x 7  |  |
| — | E23-0047-04 | Terminal x 11 |  |

## PD UNIT (X50-1380-10)

| Ref. No.  | Parts No.    | Description              | Re-<br>marks |
|-----------|--------------|--------------------------|--------------|
| CAPACITOR |              |                          |              |
| C1        | CC45SL1H070D | Ceramic 7pF ±0.5pF       |              |
| C2, 3     | CC45SL1H470K | Ceramic 47pF ±10%        |              |
| C4        | C90-0262-05  | Ceramic 0.047μF          |              |
| C5, 6     | CS15E1C2R2M  | Tantalum 2.2μF 16WV      |              |
| C7        | CS15E1VR22M  | Tantalum 0.22μF 35WV     |              |
| C8        | CE04W1HR47   | Electrolytic 0.47μF 50WV |              |
| C9        | C90-0254-05  | Ceramic 0.022μF          |              |
| C10       | CE04W1A101   | Electrolytic 100μF 10WV  |              |
| C11       | C90-0254-05  | Ceramic 0.022μF          |              |
| C12       | CE04W1A101   | Electrolytic 100μF 10WV  |              |
| C13, 14   | C90-0262-05  | Ceramic 0.047μF          |              |
| C15, 16   | CK45D1H102M  | Ceramic 1000pF ±20%      |              |
| C17       | CE04W1A101   | Electrolytic 100μF 10WV  |              |
| C18~25    | CK45D1H102M  | Ceramic 1000pF ±20%      |              |
| C26       | C90-0262-05  | Ceramic 0.047μF          |              |
| C27, 28   | CK45D1H102M  | Ceramic 1000pF ±20%      |              |

## RESISTOR

|         |              |                       |  |
|---------|--------------|-----------------------|--|
| R1      | RD14CY2B221J | Carbon 220Ω ±5% 1/8W  |  |
| R2      | RD14CY2B182J | Carbon 1.8kΩ ±5% 1/8W |  |
| R3      | RD14CY2B561J | Carbon 560Ω ±5% 1/8W  |  |
| R4      | RD14CY2B470J | Carbon 47Ω ±5% 1/8W   |  |
| R5, 6   | RD14CY2B472J | Carbon 4.7kΩ ±5% 1/8W |  |
| R7      | RD14CY2B183J | Carbon 18kΩ ±5% 1/8W  |  |
| R8, 9   | RD14CY2B182J | Carbon 1.8kΩ ±5% 1/8W |  |
| R10     | RD14CY2B472J | Carbon 4.7kΩ ±5% 1/8W |  |
| R11     | RD14CY2B332J | Carbon 3.3kΩ ±5% 1/8W |  |
| R12, 13 | RD14CY2B472J | Carbon 4.7kΩ ±5% 1/8W |  |
| R14     | RD14CY2B103J | Carbon 10kΩ ±5% 1/8W  |  |
| R15     | RD14CY2B182J | Carbon 1.8kΩ ±5% 1/8W |  |

# PARTS LIST

| Ref. No.                  | Parts No.    | Description                        | Re-<br>marks |
|---------------------------|--------------|------------------------------------|--------------|
| R16                       | RD14CY2B472J | Carbon 4.7k $\Omega$ $\pm$ 5% 1/8W |              |
| R17                       | RD14CY2B183J | Carbon 18k $\Omega$ $\pm$ 5% 1/8W  |              |
| R18                       | RD14CY2B331J | Carbon 330 $\Omega$ $\pm$ 5% 1/8W  |              |
| R19                       | RD14CY2B103J | Carbon 10k $\Omega$ $\pm$ 5% 1/8W  |              |
| R20                       | RD14CY2B151J | Carbon 150 $\Omega$ $\pm$ 5% 1/8W  |              |
| R21                       | RD14CY2B821J | Carbon 820 $\Omega$ $\pm$ 5% 1/8W  |              |
| R22                       | RD14CY2B103J | Carbon 10k $\Omega$ $\pm$ 5% 1/8W  |              |
| <b>SEMICONDUCTOR</b>      |              |                                    |              |
| Q1, 2                     | V03-0093-05  | Transistor 2SC458 (B)              |              |
| Q3                        | V03-0281-05  | Transistor 2SC1345 (E)             |              |
| Q4                        | V03-0123-05  | Transistor 2SC733 (Y)              |              |
| Q5                        | V01-0037-05  | Transistor 2SA495 (Y)              |              |
| Q6                        | V03-0079-05  | Transistor 2SC460 (B)              |              |
| IC1                       | V30-0132-05  | IC TD3400AP                        |              |
| IC2, 3                    | V30-0238-05  | IC TD3493BP                        | ☆            |
| IC4                       | V30-0173-05  | IC MC4044P                         |              |
| IC5~7                     | V30-0201-05  | IC MC4016P(MC74416P)               | ☆            |
| IC8, 9                    | V30-0132-05  | IC TD3400AP                        |              |
| IC10                      | V30-0237-05  | IC TD3474AP                        | ☆            |
| IC11                      | V30-0159-05  | IC TD3410AP                        | ☆            |
| IC12                      | V30-0236-05  | IC TD3420AP                        | ☆            |
| D1~3                      | V11-0076-05  | Diode 1S1555                       |              |
| <b>TRIMMER/COIL/X'TAL</b> |              |                                    |              |
| TC1                       | C05-0067-05  | Ceramic trimmer 25pF               |              |
| L1                        | L77-0713-05  | Crystal oscillator 5.12 MHz        | ☆            |
| L2                        | L40-1511-03  | Ferri-inductor                     |              |
| L3, 4                     | L40-1021-03  | Ferri-inductor                     |              |
| L5                        | L34-0438-05  | Coil 0.9 $\mu$ H                   |              |
| L6~8                      | L40-1021-03  | Ferri-inductor                     |              |
| <b>MISCELLANEOUS</b>      |              |                                    |              |
| —                         | E23-0046-04  | Terminal x 5                       | ☆            |
| —                         | E23-0047-04  | Terminal x 16                      |              |

## INDICATOR UNIT (X54-1210-10)

| Ref. No. | Parts No.    | Description                           | Re-<br>marks |
|----------|--------------|---------------------------------------|--------------|
| R1~6     | R90-0510-05  | Resistor block 470 $\Omega$ x 4       | ☆            |
| —        | RD14BY2B471J | Carbon 470 $\Omega$ $\pm$ 5% 1/8W x13 |              |
| VR1      | R12-0048-05  | Semi-fixed resistor 100 $\Omega$      |              |
| IC1~3    | V30-0195-05  | IC SN7447AN                           | ☆            |
| D1~6     | V11-0458-05  | LED TLR-313 (C, D)                    | ☆            |
| —        | E02-0101-05  | IC socket x 6                         |              |
| —        | E23-0047-04  | Terminal x 6                          |              |
| —        | E40-0611-05  | Mini connector wafer x 6              |              |
| —        | E40-0613-05  | Mini connector wafer x 2              |              |
| —        | E40-0616-05  | Mini connector housing x 6            |              |

## RX UNIT (X55-1150-10)

| Ref. No.         | Parts No.    | Description                     | Re-<br>marks |
|------------------|--------------|---------------------------------|--------------|
| <b>CAPACITOR</b> |              |                                 |              |
| C1               | CC45CH1H100D | Ceramic 10pF $\pm$ 0.5pF        |              |
| C2               | CC45CH1H220J | Ceramic 22pF $\pm$ 5%           |              |
| C3               | CC45CH1H330J | Ceramic 33pF $\pm$ 5%           |              |
| C4               | CK45D1H102M  | Ceramic 1000pF $\pm$ 20%        |              |
| C5               | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20% |              |
| C6               | CK45D1H102M  | Ceramic 1000pF $\pm$ 20%        |              |
| C7               | CQ92M1H103K  | Mylar 0.01 $\mu$ F $\pm$ 10%    |              |

| Ref. No. | Parts No.    | Description                     | Re-<br>marks |
|----------|--------------|---------------------------------|--------------|
| C8       | CQ92M1H223K  | Mylar 0.022 $\mu$ F $\pm$ 10%   |              |
| C9       | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20% |              |
| C10      | CC45SL1H010C | Ceramic 1pF $\pm$ 0.25pF        |              |
| C11      | CK45D1H102M  | Ceramic 1000pF $\pm$ 20%        |              |
| C12      | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20% |              |
| C13      | CK45D1H102M  | Ceramic 1000pF $\pm$ 20%        |              |
| C14      | CC45SL1H221K | Ceramic 220pF $\pm$ 10%         |              |
| C15      | CQ92M1H223K  | Mylar 0.022 $\mu$ F $\pm$ 10%   |              |
| C16, 17  | CQ92M1H223K  | Mylar 0.022 $\mu$ F $\pm$ 10%   |              |
| C18      | CK45D1H102M  | Ceramic 1000pF $\pm$ 20%        |              |
| C19      | CK45B1H471K  | Ceramic 470pF $\pm$ 10%         |              |
| C20      | CQ92M1H102K  | Mylar 1000pF $\pm$ 10%          |              |
| C21      | CQ92M1H223K  | Mylar 0.022 $\mu$ F $\pm$ 10%   |              |
| C22      | CQ92M1H393K  | Mylar 0.039 $\mu$ F $\pm$ 10%   |              |
| C23      | CQ92M1H103K  | Mylar 0.01 $\mu$ F $\pm$ 10%    |              |
| C24      | CQ92M1H223K  | Mylar 0.022 $\mu$ F $\pm$ 10%   |              |
| C25      | CK45B1H471K  | Ceramic 470pF $\pm$ 10%         |              |
| C26      | CQ92M1H103K  | Mylar 0.01 $\mu$ F $\pm$ 10%    |              |
| C27      | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20% |              |
| C28      | CC45CH1H330J | Ceramic 33pF $\pm$ 5%           |              |
| C29      | CC45CH1H070D | Ceramic 7pF $\pm$ 0.5pF         |              |
| C30      | CC45CH1H020C | Ceramic 2pF $\pm$ 0.25pF        |              |
| C31      | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20% |              |
| C32      | CE04W1A101   | Electrolytic 100 $\mu$ F 10WV   |              |
| C33      | CK45B1H681K  | Ceramic 680pF $\pm$ 10%         |              |
| C34      | CC45SL1H151K | Ceramic 150pF $\pm$ 10%         |              |
| C35      | CC45CH1H150J | Ceramic 15pF $\pm$ 5%           |              |
| C36, 37  | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20% |              |
| C38      | CC45SL1H221K | Ceramic 220pF $\pm$ 10%         |              |
| C39, 40  | CK45B1H471K  | Ceramic 470pF $\pm$ 10%         |              |
| C41      | CQ92M1H472K  | Mylar 4700pF $\pm$ 10%          |              |
| C42      | CQ92M1H223K  | Mylar 0.022 $\mu$ F $\pm$ 10%   |              |
| C43, 44  | CC45SL1H221K | Ceramic 220pF $\pm$ 10%         |              |
| C45      | CQ92M1H102K  | Mylar 1000pF $\pm$ 10%          |              |
| C46      | CQ92M1H473K  | Mylar 0.047 $\mu$ F $\pm$ 10%   |              |
| C47      | CQ92M1H223K  | Mylar 0.022 $\mu$ F $\pm$ 10%   |              |
| C48      | CE04W1E4R7   | Electrolytic 4.7 $\mu$ F 25WV   |              |
| C49, 50  | CQ92M1H682K  | Mylar 6800pF $\pm$ 10%          |              |
| C51      | CE04W1C100   | Electrolytic 10 $\mu$ F 16WV    |              |
| C52      | CQ92M1H393K  | Mylar 0.039 $\mu$ F $\pm$ 10%   |              |
| C53, 54  | CE04W1C100   | Electrolytic 10 $\mu$ F 16WV    |              |
| C55      | CC45CH1H330J | Ceramic 33pF $\pm$ 5%           |              |
| C56      | CQ92M1H393K  | Mylar 0.039 $\mu$ F $\pm$ 10%   |              |
| C57      | CE04W1E4R7   | Electrolytic 4.7 $\mu$ F 25WV   |              |
| C58      | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20% |              |
| C59      | CE04W1E4R7   | Electrolytic 4.7 $\mu$ F 25WV   |              |
| C60, 61  | CE04W1H010   | Electrolytic 1 $\mu$ F 50WV     |              |
| C62      | CE04W1A470   | Electrolytic 47 $\mu$ F 10WV    |              |
| C63      | CE04W1C220   | Electrolytic 22 $\mu$ F 16WV    |              |
| C64      | CQ92M1H223K  | Mylar 0.022 $\mu$ F $\pm$ 10%   |              |
| C65      | CQ92M1H682K  | Mylar 6800pF $\pm$ 10%          |              |
| C66, 67  | CE04W1H010   | Electrolytic 1 $\mu$ F 50WV     |              |
| C68      | CE04W1A470   | Electrolytic 47 $\mu$ F 10WV    |              |
| C69      | CQ92M1H393K  | Mylar 0.039 $\mu$ F $\pm$ 10%   |              |
| C70      | CE04W1C101   | Electrolytic 100 $\mu$ F 16WV   |              |
| C71      | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20% |              |
| C72      | CE04W1C100   | Electrolytic 10 $\mu$ F 16WV    |              |
| C73      | CQ92M1H682K  | Mylar 6800pF $\pm$ 10%          |              |
| C74      | CQ92M1H332K  | Mylar 3300pF $\pm$ 10%          |              |
| C75      | CQ92M1H152K  | Mylar 1500pF $\pm$ 10%          |              |
| C76~78   | CE04W1H010   | Electrolytic 1 $\mu$ F 50WV     |              |
| C79      | CE04W1HR47   | Electrolytic 0.47 $\mu$ F 50WV  |              |
| C80, 81  | CE04W1H010   | Electrolytic 1 $\mu$ F 50WV     |              |
| C82      | CE04W1HR47   | Electrolytic 0.47 $\mu$ F 50WV  |              |
| C83, 84  | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20% |              |
| C85      | CC45SL1H101K | Ceramic 100pF $\pm$ 10%         |              |
| C86~90   | CQ92M1H682K  | Mylar 6800pF $\pm$ 10%          |              |
| C91      | CE04W1H010   | Electrolytic 1 $\mu$ F 50WV     |              |
| C92      | CE04W1A470   | Electrolytic 47 $\mu$ F 10WV    |              |
| C93      | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20% |              |
| C94      | CE04W1C100   | Electrolytic 10 $\mu$ F 16WV    |              |

# PARTS LIST

| Ref. No.             | Parts No.    | Description                        | Re-<br>marks |
|----------------------|--------------|------------------------------------|--------------|
| C95                  | CE04W1A470   | Electrolytic 47 $\mu$ F 10WV       |              |
| C96                  | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20%    |              |
| C97                  | CE04W1HR47   | Electrolytic 0.47 $\mu$ F 50WV     |              |
| C98                  | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20%    |              |
| C99                  | CE04W1C100   | Electrolytic 10 $\mu$ F 16WV       |              |
| C100, 101            | CE04W1H010   | Electrolytic 1 $\mu$ F 50WV        |              |
| C102                 | CC45SL1H101K | Ceramic 100pF $\pm$ 10%            |              |
| <b>RESISTOR</b>      |              |                                    |              |
| R1, 2                | RD14CY2E104J | Carbon 100k $\Omega$ $\pm$ 5% 1/4W |              |
| R3                   | RD14CY2E823J | Carbon 82k $\Omega$ $\pm$ 5% 1/4W  |              |
| R4, 5                | RD14CY2E101J | Carbon 100 $\Omega$ $\pm$ 5% 1/4W  |              |
| R6                   | RD14BY2E151J | Carbon 150 $\Omega$ $\pm$ 5% 1/4W  |              |
| R7, 8                | RD14CY2E104J | Carbon 100k $\Omega$ $\pm$ 5% 1/4W |              |
| R9                   | RD14CY2E470J | Carbon 47 $\Omega$ $\pm$ 5% 1/4W   |              |
| R10                  | RD14CY2E101J | Carbon 100 $\Omega$ $\pm$ 5% 1/4W  |              |
| R11                  | RD14CY2E332J | Carbon 3.3k $\Omega$ $\pm$ 5% 1/4W |              |
| R12                  | RD14CY2E153J | Carbon 15k $\Omega$ $\pm$ 5% 1/4W  |              |
| R13                  | RD14CY2E472J | Carbon 4.7k $\Omega$ $\pm$ 5% 1/4W |              |
| R14                  | RD14CY2E151J | Carbon 150 $\Omega$ $\pm$ 5% 1/4W  |              |
| R15                  | RD14CY2E331J | Carbon 330 $\Omega$ $\pm$ 5% 1/4W  |              |
| R16                  | RD14CY2E333J | Carbon 33k $\Omega$ $\pm$ 5% 1/4W  |              |
| R17                  | RD14CY2E472J | Carbon 4.7k $\Omega$ $\pm$ 5% 1/4W |              |
| R18                  | RD14CY2E102J | Carbon 1k $\Omega$ $\pm$ 5% 1/4W   |              |
| R19                  | RD14CY2E332J | Carbon 3.3k $\Omega$ $\pm$ 5% 1/4W |              |
| R20                  | RD14CY2E152J | Carbon 1.5k $\Omega$ $\pm$ 5% 1/4W |              |
| R21                  | RD14CY2E183J | Carbon 18k $\Omega$ $\pm$ 5% 1/4W  |              |
| R22                  | RD14CY2E104J | Carbon 100k $\Omega$ $\pm$ 5% 1/4W |              |
| R23                  | RD14CY2E332J | Carbon 3.3k $\Omega$ $\pm$ 5% 1/4W |              |
| R24                  | RD14CY2E562J | Carbon 5.6k $\Omega$ $\pm$ 5% 1/4W |              |
| R25                  | RD14CY2E333J | Carbon 33k $\Omega$ $\pm$ 5% 1/4W  |              |
| R26, 27              | RD14CY2E561J | Carbon 560 $\Omega$ $\pm$ 5% 1/4W  |              |
| R28                  | RD14CY2E681J | Carbon 680 $\Omega$ $\pm$ 5% 1/4W  |              |
| R29                  | RD14CY2E274J | Carbon 270k $\Omega$ $\pm$ 5% 1/4W |              |
| R30                  | RD14CY2E102J | Carbon 1k $\Omega$ $\pm$ 5% 1/4W   |              |
| R31                  | RD14CY2E153J | Carbon 15k $\Omega$ $\pm$ 5% 1/4W  |              |
| R32                  | RD14CY2E562J | Carbon 5.6k $\Omega$ $\pm$ 5% 1/4W |              |
| R33                  | RD14CY2E102J | Carbon 1k $\Omega$ $\pm$ 5% 1/4W   |              |
| R34                  | RD14CY2E222J | Carbon 2.2k $\Omega$ $\pm$ 5% 1/4W |              |
| R35                  | RD14CY2E472J | Carbon 4.7k $\Omega$ $\pm$ 5% 1/4W |              |
| R36                  | RD14CY2E104J | Carbon 100k $\Omega$ $\pm$ 5% 1/4W |              |
| R37                  | RD14CY2E471J | Carbon 470 $\Omega$ $\pm$ 5% 1/4W  |              |
| R38                  | RD14CY2E332J | Carbon 3.3k $\Omega$ $\pm$ 5% 1/4W |              |
| R39                  | RD14CY2E103J | Carbon 10k $\Omega$ $\pm$ 5% 1/4W  |              |
| R40                  | RD14CY2E472J | Carbon 4.7k $\Omega$ $\pm$ 5% 1/4W |              |
| R41                  | RD14CY2E471J | Carbon 470 $\Omega$ $\pm$ 5% 1/4W  |              |
| R42                  | RD14CY2E561J | Carbon 560 $\Omega$ $\pm$ 5% 1/4W  |              |
| R43, 44              | RD14CY2E102J | Carbon 1k $\Omega$ $\pm$ 5% 1/4W   |              |
| R45, 46              | RD14CY2E472J | Carbon 4.7k $\Omega$ $\pm$ 5% 1/4W |              |
| R47                  | RD14CY2E153J | Carbon 15k $\Omega$ $\pm$ 5% 1/4W  |              |
| R48                  | RD14CY2E101J | Carbon 100 $\Omega$ $\pm$ 5% 1/4W  |              |
| R49                  | RD14CY2E472J | Carbon 4.7k $\Omega$ $\pm$ 5% 1/4W |              |
| R50                  | RD14CY2E563J | Carbon 56k $\Omega$ $\pm$ 5% 1/4W  |              |
| R51                  | RD14CY2E104J | Carbon 100k $\Omega$ $\pm$ 5% 1/4W |              |
| R52                  | RD14CY2E563J | Carbon 56k $\Omega$ $\pm$ 5% 1/4W  |              |
| R53                  | RD14CY2E154J | Carbon 150k $\Omega$ $\pm$ 5% 1/4W |              |
| R54                  | RD14CY2E223J | Carbon 22k $\Omega$ $\pm$ 5% 1/4W  |              |
| R55                  | RD14CY2E183J | Carbon 18k $\Omega$ $\pm$ 5% 1/4W  |              |
| R56                  | RD14CY2E562J | Carbon 5.6k $\Omega$ $\pm$ 5% 1/4W |              |
| R57                  | RD14CY2E223J | Carbon 22k $\Omega$ $\pm$ 5% 1/4W  |              |
| R58                  | RD14CY2E222J | Carbon 2.2k $\Omega$ $\pm$ 5% 1/4W |              |
| R59                  | RD14CY2E470J | Carbon 47 $\Omega$ $\pm$ 5% 1/4W   |              |
| R60, 61              | RD14CY2E102J | Carbon 1k $\Omega$ $\pm$ 5% 1/4W   |              |
| R62                  | RD14CY2E473J | Carbon 47k $\Omega$ $\pm$ 5% 1/4W  |              |
| R63                  | RD14CY2E223J | Carbon 22k $\Omega$ $\pm$ 5% 1/4W  |              |
| R64                  | RD14CY2E222J | Carbon 2.2k $\Omega$ $\pm$ 5% 1/4W |              |
| R65                  | RD14CY2E472J | Carbon 4.7k $\Omega$ $\pm$ 5% 1/4W |              |
| R66                  | RD14CY2E331J | Carbon 330 $\Omega$ $\pm$ 5% 1/4W  |              |
| R67                  | RD14CY2E562J | Carbon 5.6k $\Omega$ $\pm$ 5% 1/4W |              |
| R68, 69              | RD14CY2E223J | Carbon 22k $\Omega$ $\pm$ 5% 1/4W  |              |
| R70                  | RD14CY2E101J | Carbon 100 $\Omega$ $\pm$ 5% 1/4W  |              |
| R71                  | RD14CY2E470J | Carbon 47 $\Omega$ $\pm$ 5% 1/4W   |              |
| R72                  | RD14CY2E101J | Carbon 100 $\Omega$ $\pm$ 5% 1/4W  |              |
| R73                  | RD14CY2E102J | Carbon 1k $\Omega$ $\pm$ 5% 1/4W   |              |
| R74                  | RD14CY2E101J | Carbon 100 $\Omega$ $\pm$ 5% 1/4W  |              |
| R75                  | RD14CY2E102J | Carbon 1k $\Omega$ $\pm$ 5% 1/4W   |              |
| R76, 77              | RS14AB3A010J | Metal film 1 $\Omega$ $\pm$ 5% 1W  |              |
| R78                  | RD14CY2E561J | Carbon 560 $\Omega$ $\pm$ 5% 1/4W  |              |
| R79                  | RD14CY2E563J | Carbon 56k $\Omega$ $\pm$ 5% 1/4W  |              |
| R80                  | RD14CY2E105J | Carbon 1M $\Omega$ $\pm$ 5% 1/4W   |              |
| R81~83               | RD14CY2E154J | Carbon 150k $\Omega$ $\pm$ 5% 1/4W |              |
| R84                  | RD14CY2E105J | Carbon 1M $\Omega$ $\pm$ 5% 1/4W   |              |
| R85                  | RD14CY2E153J | Carbon 15k $\Omega$ $\pm$ 5% 1/4W  |              |
| R86                  | RD14CY2E562J | Carbon 5.6k $\Omega$ $\pm$ 5% 1/4W |              |
| R87, 88              | RD14CY2E103J | Carbon 10k $\Omega$ $\pm$ 5% 1/4W  |              |
| R89                  | RD14CY2E473J | Carbon 47k $\Omega$ $\pm$ 5% 1/4W  |              |
| R90                  | RD14CY2E223J | Carbon 22k $\Omega$ $\pm$ 5% 1/4W  |              |
| R91                  | RD14CY2E473J | Carbon 47k $\Omega$ $\pm$ 5% 1/4W  |              |
| R92, 93              | RD14CY2E103J | Carbon 10k $\Omega$ $\pm$ 5% 1/4W  |              |
| R94                  | RD14CY2E473J | Carbon 47k $\Omega$ $\pm$ 5% 1/4W  |              |
| R95                  | RD14CY2E333J | Carbon 33k $\Omega$ $\pm$ 5% 1/4W  |              |
| R96                  | RD14CY2E103J | Carbon 10k $\Omega$ $\pm$ 5% 1/4W  |              |
| R97                  | RD14CY2E682J | Carbon 6.8k $\Omega$ $\pm$ 5% 1/4W |              |
| R98                  | RD14CY2E105J | Carbon 1M $\Omega$ $\pm$ 5% 1/4W   |              |
| R99                  | RD14CY2E274J | Carbon 270k $\Omega$ $\pm$ 5% 1/4W |              |
| R100                 | RD14CY2E124J | Carbon 120k $\Omega$ $\pm$ 5% 1/4W |              |
| R101                 | RD14CY2E683J | Carbon 68k $\Omega$ $\pm$ 5% 1/4W  |              |
| R102                 | RD14CY2E103J | Carbon 10k $\Omega$ $\pm$ 5% 1/4W  |              |
| R103                 | RD14CY2E124J | Carbon 120k $\Omega$ $\pm$ 5% 1/4W |              |
| R104                 | RD14CY2E274J | Carbon 270k $\Omega$ $\pm$ 5% 1/4W |              |
| R105                 | RD14CY2E105J | Carbon 1M $\Omega$ $\pm$ 5% 1/4W   |              |
| R106                 | RD14CY2E103J | Carbon 10k $\Omega$ $\pm$ 5% 1/4W  |              |
| R107                 | RD14CY2E473J | Carbon 47k $\Omega$ $\pm$ 5% 1/4W  |              |
| R108                 | RD14CY2E102J | Carbon 1k $\Omega$ $\pm$ 5% 1/4W   |              |
| R109                 | RD14CY2E473J | Carbon 47k $\Omega$ $\pm$ 5% 1/4W  |              |
| R110                 | RD14CY2E471J | Carbon 470 $\Omega$ $\pm$ 5% 1/4W  |              |
| R111                 | RC05GF2H5R6J | Carbon 5.6 $\Omega$ $\pm$ 5% 1/2W  |              |
| R112                 | RD14CY2E103J | Carbon 10k $\Omega$ $\pm$ 5% 1/4W  |              |
| R113                 | RD14CY2E332J | Carbon 3.3k $\Omega$ $\pm$ 5% 1/4W |              |
| R114, 115            | RD14CY2E472J | Carbon 4.7k $\Omega$ $\pm$ 5% 1/4W |              |
| R116                 | RD14CY2E561J | Carbon 560 $\Omega$ $\pm$ 5% 1/4W  |              |
| R117                 | RD14CY2E333J | Carbon 33k $\Omega$ $\pm$ 5% 1/4W  |              |
| R118                 | RD14CY2E472J | Carbon 4.7k $\Omega$ $\pm$ 5% 1/4W |              |
| R119                 | RD14CY2E473J | Carbon 47k $\Omega$ $\pm$ 5% 1/4W  |              |
| R120                 | RD14CY2E153J | Carbon 15k $\Omega$ $\pm$ 5% 1/4W  |              |
| <b>POTENTIOMETER</b> |              |                                    |              |
| VR1                  | R12-4016-05  | Semi-fixed resistor 50k $\Omega$   |              |
| VR2, 3               | R12-3025-05  | Semi-fixed resistor 10k $\Omega$   |              |
| <b>SEMICONDUCTOR</b> |              |                                    |              |
| Q1                   | V09-0081-05  | FET 3SK40 (L) or 3SK41 (L)         |              |
| Q2                   | V09-0057-05  | FET 3SK41 (L, M)                   |              |
| Q3, 4                | V03-0079-05  | Transistor 2SC460 (B)              |              |
| Q5, 6                | V03-0299-05  | Transistor 2SC1000 (GR)            |              |
| Q7~10                | V03-0079-05  | Transistor 2SC460 (B)              |              |
| Q11                  | V30-0143-05  | Hi-bread IC H8D5022                |              |
| Q12                  | V30-0138-05  | IC TA7120P                         | ☆            |
| Q13, 14              | V03-0093-05  | Transistor 2SC458 (B)              |              |
| Q15                  | V03-0299-05  | Transistor 2SC1000 (GR)            |              |
| Q16                  | V03-0126-05  | Transistor 2SC734 (Y)              |              |
| Q17, 18              | V04-0046-05  | Transistor 2SD235 (Y)              |              |
| Q19, 20              | V03-0093-05  | Transistor 2SC458 (B)              |              |
| Q21                  | V01-0037-05  | Transistor 2SA495 (Y, O)           |              |
| Q22, 23              | V03-0093-05  | Transistor 2SC458 (B)              |              |
| Q24, 25              | V03-0299-05  | Transistor 2SC1000 (GR)            |              |
| Q26                  | V03-0093-05  | Transistor 2SC458 (B)              |              |
| Q27, 28              | V03-0336-05  | Transistor 2SC496 (Y, O)           |              |
| Q29                  | V03-0093-05  | Transistor 2SC458 (B)              |              |
| Q30                  | V03-0270-05  | Transistor 2SC945 (QR)             |              |
| D1, 2                | V11-0051-05  | Diode 1N60                         |              |
| D3~6                 | V11-0076-05  | Diode 1S1555                       |              |



# PARTS LIST

| Ref. No. | Parts No.   | Description        | Re-<br>marks |
|----------|-------------|--------------------|--------------|
| D7~10    | V11-0051-05 | Diode 1N60         |              |
| D11      | V11-0076-05 | Diode 1S1555       |              |
| D12, 13  | V11-0051-05 | Diode 1N60         |              |
| D14, 15  | V11-0076-05 | Diode 1S1555       |              |
| D16      | V11-0240-05 | Zener diode WZ-090 |              |
| D17      | V11-0051-05 | Diode 1N60         |              |

## COIL

|         |             |                              |   |
|---------|-------------|------------------------------|---|
| L1      | L31-0267-05 | ANT coil                     |   |
| L2      | L79-0402-05 | Helical block                | ☆ |
| L3      | L30-0005-05 | IFT                          |   |
| L4      | L71-0201-05 | Monolithic filter            | ☆ |
| L5      | L30-0289-05 | IFT                          |   |
| L6      | L72-0014-05 | Ceramic filter               |   |
| L7      | L72-0037-05 | Ceramic filter               |   |
| L8      | L30-0199-05 | IFT                          |   |
| L9      | L31-0180-05 | Tuning coil                  |   |
| L10     | L40-1021-03 | Ferri-inductor               |   |
| L11     | L77-0327-05 | Crystal oscillator 10.245MHz |   |
| L12     | L40-1021-03 | Ferri-inductor               |   |
| L13     | L30-0285-05 | Discri coil (D)              |   |
| L14     | L30-0286-05 | Discri coil (E)              |   |
| L15, 16 | L40-2225-04 | Ferri-inductor               |   |
| L17     | L12-0013-05 | Input transformer            |   |

## MISCELLANEOUS

|   |             |                       |  |
|---|-------------|-----------------------|--|
| — | E23-0047-04 | Terminal x 31         |  |
| — | E40-0611-05 | Mini connector wafer  |  |
| — | F01-0150-14 | Heat sink             |  |
| — | F07-0313-14 | Shield cover          |  |
| — | F20-0078-05 | Insulation plate x 2  |  |
| — | F29-0014-05 | Insulation washer x 2 |  |

## TX UNIT (X56-1230-10)

| Ref. No.         | Parts No.    | Description                     | Re-<br>marks |
|------------------|--------------|---------------------------------|--------------|
| <b>CAPACITOR</b> |              |                                 |              |
| C2               | CE04W1C100   | Electrolytic 10 $\mu$ F 16WV    |              |
| C3               | CE04W1A470   | Electrolytic 47 $\mu$ F 10WV    |              |
| C4               | CS15E1V0R1M  | Tantalum 0.1 $\mu$ F 35WV       |              |
| C5               | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20% |              |
| C6               | CE04W1E4R7   | Electrolytic 4.7 $\mu$ F 25WV   |              |
| C7               | CE04W1A470   | Electrolytic 47 $\mu$ F 10WV    |              |
| C8               | CC45CH1H050D | Ceramic 5pF $\pm$ 0.5pF         |              |
| C9               | CE04W1H010   | Electrolytic 1 $\mu$ F 50WV     |              |
| C10              | CQ92M1H103K  | Mylar 0.01 $\mu$ F $\pm$ 10%    |              |
| C11              | CQ92M1H393K  | Mylar 0.039 $\mu$ F $\pm$ 10%   |              |
| C12              | CQ92M1H473K  | Mylar 0.047 $\mu$ F $\pm$ 10%   |              |
| C13              | CC45CH1H330J | Ceramic 33pF $\pm$ 5%           |              |
| C14              | CC45UJ1H050D | Ceramic 5pF $\pm$ 0.5pF         |              |
| C15, 16          | CC45SL1H221K | Ceramic 220pF $\pm$ 10%         |              |
| C17              | CC45CH1H220J | Ceramic 22pF $\pm$ 5%           |              |
| C18~22           | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20% |              |
| C23              | CC45CH1H330J | Ceramic 33pF $\pm$ 5%           |              |
| C24, 25          | CK45D1H102M  | Ceramic 1000pF $\pm$ 20%        |              |
| C26              | CC45TH1H220J | Ceramic 22pF $\pm$ 5%           |              |
| C27, 28          | CC45CH1H330J | Ceramic 33pF $\pm$ 5%           |              |
| C29, 30          | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20% |              |
| C31              | CK45TH1H220J | Ceramic 22pF $\pm$ 5%           |              |
| C32              | CC45CH1H050D | Ceramic 5pF $\pm$ 0.5pF         |              |
| C33              | CC45SL1H0R5C | Ceramic 0.5pF $\pm$ 0.25pF      |              |
| C34, 35          | CC45TH1H150J | Ceramic 15pF $\pm$ 5%           |              |
| C36              | CC45SL1H0R5C | Ceramic 0.5pF $\pm$ 0.25pF      |              |
| C37              | CC45TH1H150J | Ceramic 15pF $\pm$ 5%           |              |
| C38              | CC45CH1H470J | Ceramic 47pF $\pm$ 5%           |              |
| C39, 40          | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20% |              |
| C41, 42          | CE04W1A470   | Electrolytic 47 $\mu$ F 10WV    |              |

| Ref. No. | Parts No.    | Description                     | Re-<br>marks |
|----------|--------------|---------------------------------|--------------|
| C43      | CS15E1V0R1M  | Tantalum 0.1 $\mu$ F 35WV       |              |
| C44      | CE04W1C100   | Electrolytic 10 $\mu$ F 16WV    |              |
| C45      | CE04W1A470   | Electrolytic 47 $\mu$ F 10WV    |              |
| C46      | CQ92M1H102K  | Mylar 1000pF $\pm$ 10%          |              |
| C47      | CE04W1H010   | Electrolytic 1 $\mu$ F 50WV     |              |
| C48, 49  | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20% |              |
| C50      | CE04W1C100   | Electrolytic 10 $\mu$ F 16WV    |              |
| C51      | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20% |              |
| C52      | CE04W1HR47   | Electrolytic 0.47 $\mu$ F 50WV  |              |
| C53      | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20% |              |
| C54      | CC45UJ1H220J | Ceramic 22pF $\pm$ 5%           |              |
| C55      | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20% |              |
| C56      | CE04W1A470   | Electrolytic 47 $\mu$ F 10WV    |              |
| C57      | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20% |              |
| C58~60   | CK45D1H102M  | Ceramic 1000pF $\pm$ 20%        |              |
| C61      | CC45CH1H100D | Ceramic 10pF $\pm$ 0.5pF        |              |
| C62, 63  | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20% |              |
| C64      | CK45D1H102M  | Ceramic 1000pF $\pm$ 20%        |              |
| C65      | CC45SL2H100D | Ceramic 10pF $\pm$ 0.5pF        |              |
| C66      | CK45D1H102M  | Ceramic 1000pF $\pm$ 20%        |              |
| C67      | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20% |              |
| C68      | CC45SL2H050D | Ceramic 5pF $\pm$ 0.5pF         |              |

## RESISTOR

|         |              |                                    |  |
|---------|--------------|------------------------------------|--|
| R1      | RD14CY2E101J | Carbon 100 $\Omega$ $\pm$ 5% 1/4W  |  |
| R2      | RD14CY2E561J | Carbon 560 $\Omega$ $\pm$ 5% 1/4W  |  |
| R3      | RD14CY2E102J | Carbon 1k $\Omega$ $\pm$ 5% 1/4W   |  |
| R5      | RD14CY2B333J | Carbon 33k $\Omega$ $\pm$ 5% 1/8W  |  |
| R6      | RD14BY2E333J | Carbon 33k $\Omega$ $\pm$ 5% 1/4W  |  |
| R7      | RD14CY2E473J | Carbon 47k $\Omega$ $\pm$ 5% 1/4W  |  |
| R8      | RD14CY2E223J | Carbon 22k $\Omega$ $\pm$ 5% 1/4W  |  |
| R9      | RD14CY2E102J | Carbon 1k $\Omega$ $\pm$ 5% 1/4W   |  |
| R10     | RD14CY2E472J | Carbon 4.7k $\Omega$ $\pm$ 5% 1/4W |  |
| R11     | RD14CY2E153J | Carbon 15k $\Omega$ $\pm$ 5% 1/4W  |  |
| R12     | RD14CY2E102J | Carbon 1k $\Omega$ $\pm$ 5% 1/4W   |  |
| R13     | RD14CY2E221J | Carbon 220 $\Omega$ $\pm$ 5% 1/4W  |  |
| R14, 15 | RD14CY2E103J | Carbon 10k $\Omega$ $\pm$ 5% 1/4W  |  |
| R16     | RD14CY2E102J | Carbon 1k $\Omega$ $\pm$ 5% 1/4W   |  |
| R17     | RD14CY2E101J | Carbon 100 $\Omega$ $\pm$ 5% 1/4W  |  |
| R18~21  | RD14CY2E473J | Carbon 47k $\Omega$ $\pm$ 5% 1/4W  |  |
| R22     | RD14CY2E103J | Carbon 10k $\Omega$ $\pm$ 5% 1/4W  |  |
| R23     | RD14CY2E333J | Carbon 33k $\Omega$ $\pm$ 5% 1/4W  |  |
| R24     | RD14CY2E103J | Carbon 10k $\Omega$ $\pm$ 5% 1/4W  |  |
| R25     | RD14CY2E563J | Carbon 56k $\Omega$ $\pm$ 5% 1/4W  |  |
| R26     | RD14CY2E103J | Carbon 10k $\Omega$ $\pm$ 5% 1/4W  |  |
| R27     | RD14CY2E473J | Carbon 47k $\Omega$ $\pm$ 5% 1/4W  |  |
| R28     | RD14CY2E682J | Carbon 6.8k $\Omega$ $\pm$ 5% 1/4W |  |
| R29     | RD14CY2E333J | Carbon 33k $\Omega$ $\pm$ 5% 1/4W  |  |
| R30, 31 | RD14CY2E472J | Carbon 4.7k $\Omega$ $\pm$ 5% 1/4W |  |
| R32     | RD14CY2E102J | Carbon 1k $\Omega$ $\pm$ 5% 1/4W   |  |
| R33     | RD14CY2E473J | Carbon 47k $\Omega$ $\pm$ 5% 1/4W  |  |
| R34     | RD14CY2E332J | Carbon 3.3k $\Omega$ $\pm$ 5% 1/4W |  |
| R35     | RD14CY2E222J | Carbon 2.2k $\Omega$ $\pm$ 5% 1/4W |  |
| R36     | RD14CY2E154J | Carbon 150k $\Omega$ $\pm$ 5% 1/4W |  |
| R37     | RD14CY2E104J | Carbon 100k $\Omega$ $\pm$ 5% 1/4W |  |
| R38     | RD14CY2E103J | Carbon 10k $\Omega$ $\pm$ 5% 1/4W  |  |
| R39     | RD14CY2E681J | Carbon 680 $\Omega$ $\pm$ 5% 1/4W  |  |
| R40     | RD14CY2E471J | Carbon 470 $\Omega$ $\pm$ 5% 1/4W  |  |
| R41     | RC05GF2H5R6J | Carbon 5.6 $\Omega$ $\pm$ 5% 1/2W  |  |
| R42     | RD14CY2E561J | Carbon 560 $\Omega$ $\pm$ 5% 1/4W  |  |
| R43     | RD14CY2E471J | Carbon 470 $\Omega$ $\pm$ 5% 1/4W  |  |
| R44     | RD14CY2E682J | Carbon 6.8k $\Omega$ $\pm$ 5% 1/4W |  |
| R45     | RD14CY2E471J | Carbon 470 $\Omega$ $\pm$ 5% 1/4W  |  |
| R46     | RD14CY2E561J | Carbon 560 $\Omega$ $\pm$ 5% 1/4W  |  |
| R47     | RD14CY2E681J | Carbon 680 $\Omega$ $\pm$ 5% 1/4W  |  |
| R48, 49 | RD14CY2E103J | Carbon 10k $\Omega$ $\pm$ 5% 1/4W  |  |
| R50     | RD14CY2E153J | Carbon 15k $\Omega$ $\pm$ 5% 1/4W  |  |
| R51     | RD14CY2E100J | Carbon 10 $\Omega$ $\pm$ 5% 1/4W   |  |
| R52     | RD14CY2E470J | Carbon 47 $\Omega$ $\pm$ 5% 1/4W   |  |
| R53     | RD14BY2E102J | Carbon 1k $\Omega$ $\pm$ 5% 1/4W   |  |

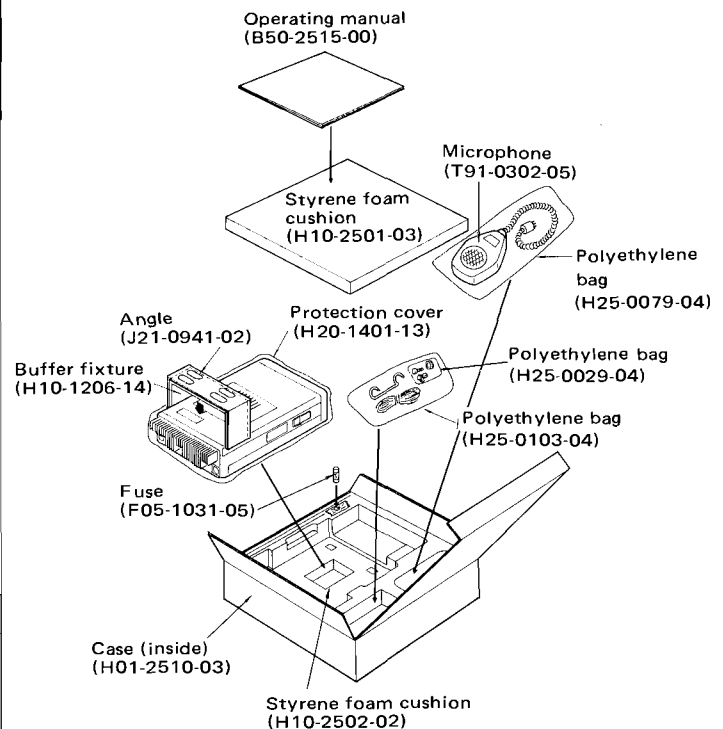
# PARTS LIST/PACKING

| Ref. No.             | Parts No.    | Description                   | Re-<br>marks |
|----------------------|--------------|-------------------------------|--------------|
| R54                  | RD14BY2E101J | Carbon 100Ω ±5% 1/4W          |              |
| <b>POTENTIOMETER</b> |              |                               |              |
| VR1, 2               | R12-2015-05  | Semi-fixed resistor 5kΩ       |              |
| VR3                  | R12-0042-05  | Semi-fixed resistor 500Ω      |              |
| VR4                  | R12-4016-05  | Semi-fixed resistor 50kΩ      |              |
| VR5                  | R12-0042-05  | Semi-fixed resistor 500Ω      |              |
| TC1                  | C05-0030-15  | Ceramic trimmer 20pF          |              |
| TC2~4                | C05-0013-15  | Ceramic trimmer 20pF          |              |
| <b>SEMICONDUCTOR</b> |              |                               |              |
| Q1                   | V30-0039-05  | IC TA7061AP                   |              |
| Q2, 3                | V03-0079-05  | Transistor 2SC460 (B)         |              |
| Q4, 5                | V09-0012-05  | FET 2SK19 (GR)                |              |
| Q6~8                 | V03-0093-05  | Transistor 2SC458 (B)         |              |
| Q9                   | V03-0336-05  | Transistor 2SC496 (Y, O)      |              |
| Q10                  | V01-0113-05  | Transistor 2SA496 (Y, O)      |              |
| Q11, 12              | V03-0126-05  | Transistor 2SC734 (Y, O)      |              |
| Q13                  | V09-0057-05  | FET 3SK41 (L, M)              |              |
| Q14                  | V03-0283-05  | Transistor 2SC741             |              |
| Q15                  | V03-0489-05  | Transistor 2SC908             | ☆            |
| D1~5                 | V11-0273-05  | Diode 1S2208                  |              |
| D2~5                 | V11-7761-86  | Diode 1TT410                  | ☆            |
| D6, 7                | V11-0076-05  | Diode 1S1555                  |              |
| D8                   | V11-0247-05  | Zener diode WZ-100            |              |
| D9                   | V11-0076-05  | Diode 1S1555                  |              |
| D10                  | V11-0243-05  | Zener diode WZ-061            |              |
| D11, 12              | V11-0076-05  | Diode 1S1555                  |              |
| <b>COIL</b>          |              |                               |              |
| L1                   | L40-1545-06  | Ferri-inductor                |              |
| L2                   | L33-0264-05  | Choke coil 30μH               |              |
| L3                   | L39-0069-05  | Variable inductor 15μH        |              |
| L4                   | L33-0236-05  | Choke coil 10μH               |              |
| L5                   | L77-0710-05  | Crystal oscillator 10.715 MHz |              |
| L6                   | L40-1021-03  | Ferri-inductor                |              |
| L7                   | L30-0005-05  | IFT                           |              |
| L8                   | L31-0313-05  | Tuning coil                   |              |
| L9, 10               | L40-1001-03  | Ferri-inductor                |              |
| L11                  | L31-0344-05  | Tuning coil                   |              |
| L12                  | L31-0180-05  | Tuning coil                   |              |
| L13, 14              | L31-0267-05  | Tuning coil                   |              |
| L15                  | L34-0388-05  | VHF coil 6φ 5T                |              |
| L16                  | L40-1021-03  | Ferri-inductor                |              |
| L17                  | L34-0606-05  | VHF coil 6φ 6T                | ☆            |
| L18                  | L34-0387-05  | VHF coil 6φ 4T                |              |
| L19                  | L34-0499-05  | VHF coil 3μ 4T                |              |
| L20                  | L34-0387-05  | VHF coil 6φ 4T                |              |
| L21                  | L33-0235-05  | Choke coil (with 100Ω)        |              |
| L22                  | L34-0452-05  | VHF coil 3φ 6T                |              |
| <b>MISCELLANEOUS</b> |              |                               |              |
| J1                   | E18-0307-15  | Monofolk socket               |              |
| —                    | E23-0046-04  | Terminal                      |              |
| —                    | E23-0047-04  | Terminal x 26                 |              |
| —                    | F02-0030-05  | Heat sink (for Q14)           |              |
| —                    | F02-0401-05  | Heat sink (for Q15)           | ☆            |

## ACCESSORIES SUPPLIED

- Dynamic microphone equipped with 4-pin plug (T91-0302-05) . . . . . 1 piece
- Mounting bracket (J21-0941-02) . . . . . 1 piece
- Mounting parts  
Screws, 6mm diameter (N09-0008-04) . . . . . 4 pieces  
Plain washers, 6mm diameter (N15-1060-46) 4 pieces  
Spring washers, 6mm diameter (N16-0060-41) 4 pieces  
Nuts, 6mm diameter (N14-0009-04) . . . . . 4 pieces
- Stand-off bracket (J01-0021-04) . . . . . 1 piece
- Label . . . . . 1 sheet
- Spare fuse, 10A (F05-1031-05) . . . . . 1 piece
- DC power cord with plug and fuse . . . . . 1 piece
- Miniature plug for external speaker and touch tone pad (E12-0001-05) . . . . . 2 pieces
- Plug-equipped PC board for tone squelch . . 1 sheet
- Operating manual (B50-2515-00) . . . . . 1 copy

## PACKING



# DISASSEMBLY

## REMOVING THE CASE (Refer to Fig. 6)

1. Remove the screws ① ~ ⑩.
2. Remove the upper and lower cases.

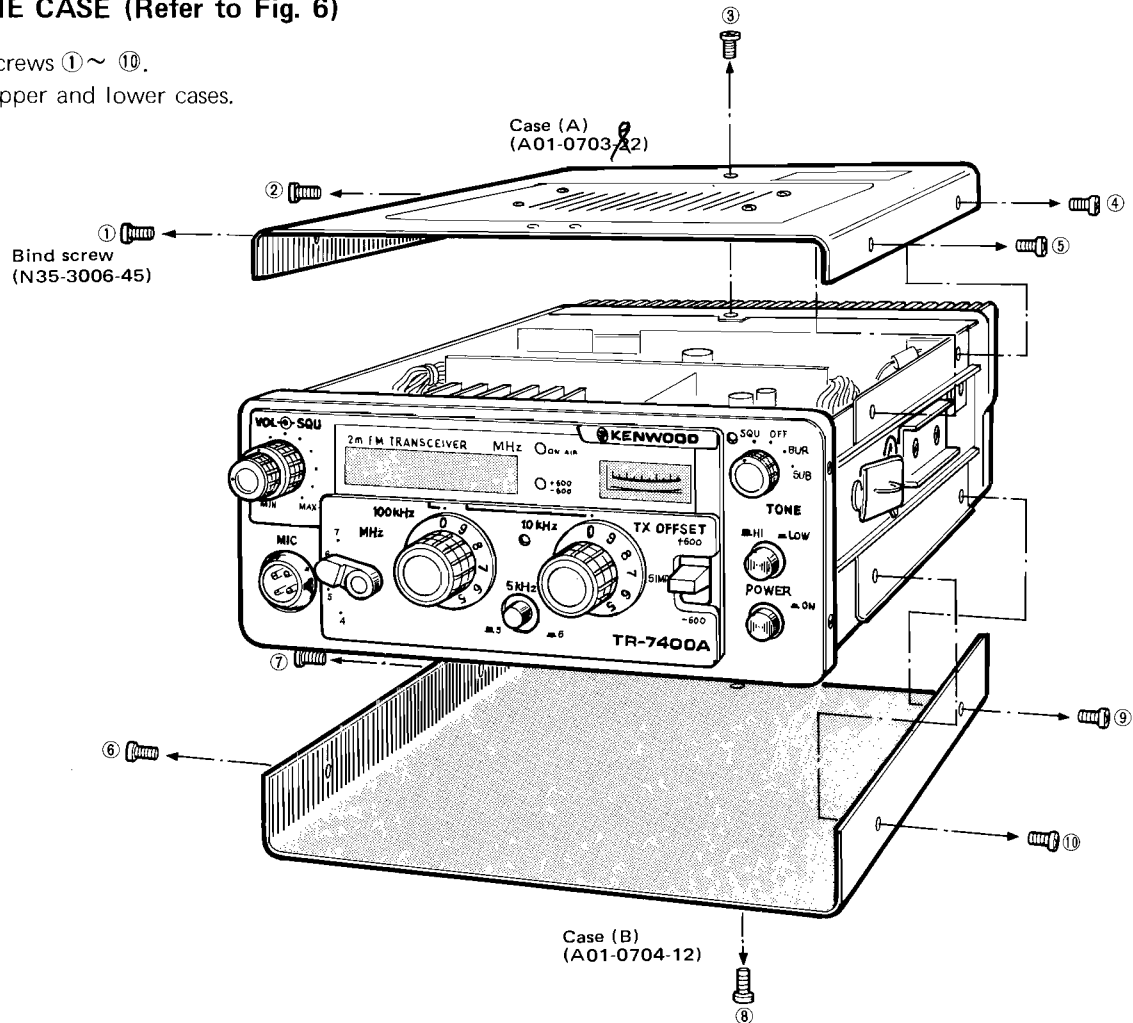


Fig. 6 Removing the Case

## REMOVING THE PANEL (Refer to Fig. 7)

1. Remove the knobs.
2. Remove the screws A ~ D.
3. Remove the panel and the subpanel.

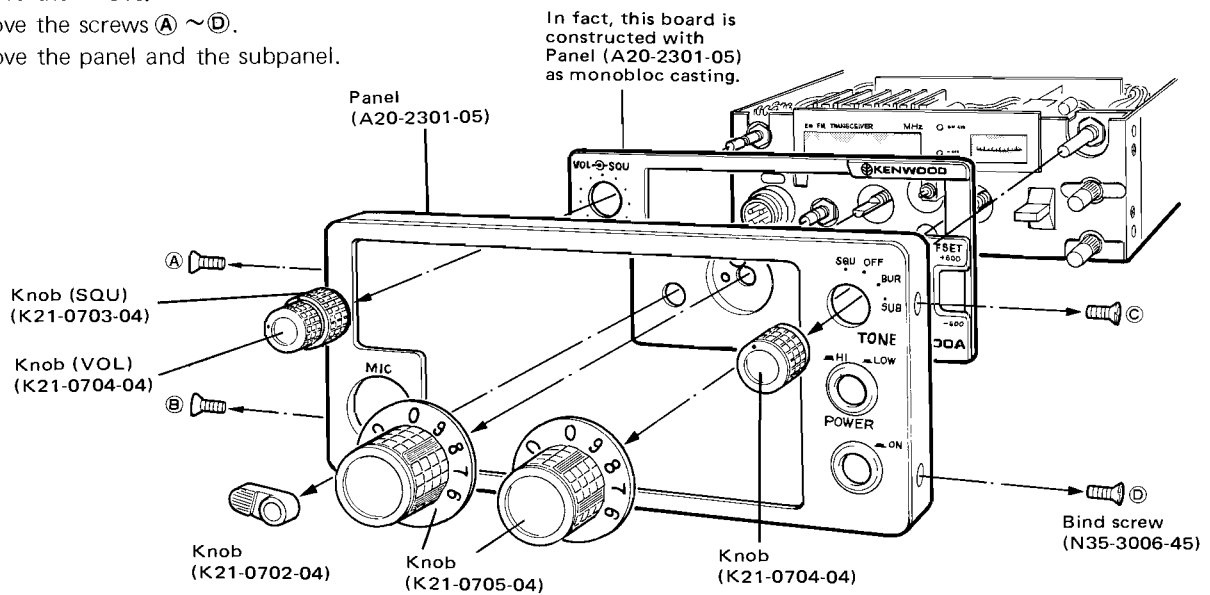


Fig. 7 Removing the Panel

# DISASSEMBLY

## REMOVING THE INDICATOR (Refer to Fig. 8)

1. Remove the cases.
2. Remove the panel.
3. Remove the screws ①, ② and remove the front glass.
4. Pull out the necessary part of the indicator upward.

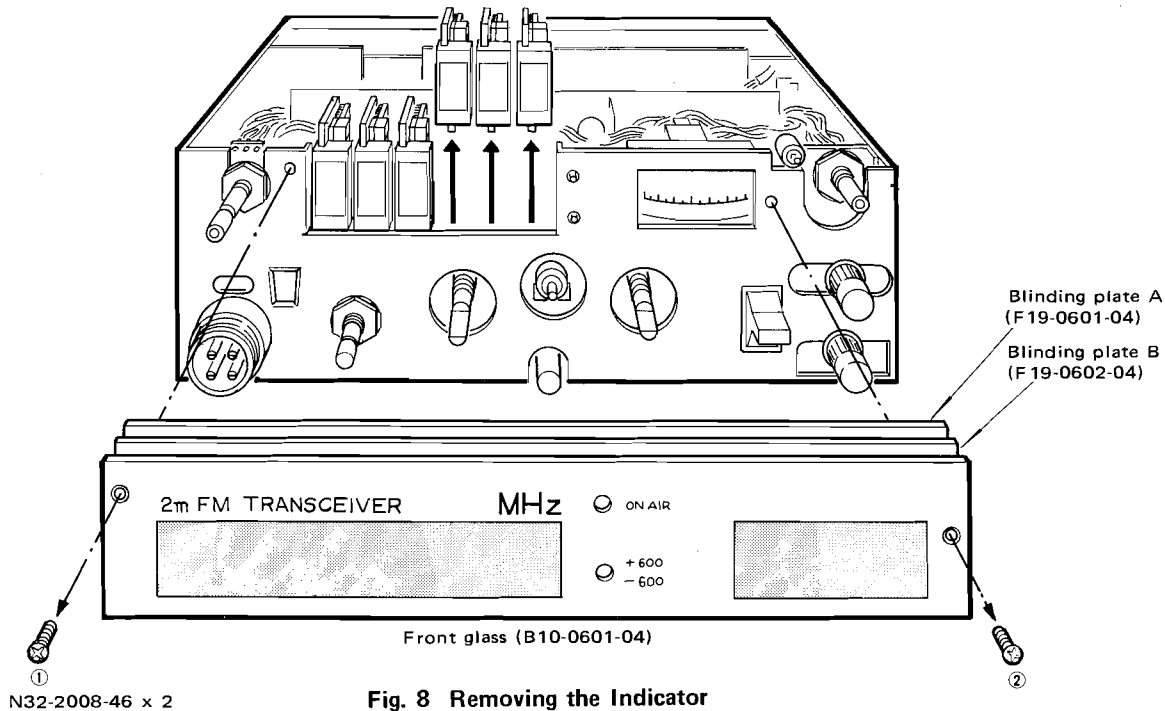


Fig. 8 Removing the Indicator

## REMOVING THE FINAL SECTION (Refer to Fig. 9)

1. Remove the leads (A) and (B) from the terminal pins.
2. Remove the screws ①~④.
3. Pull Final section out.

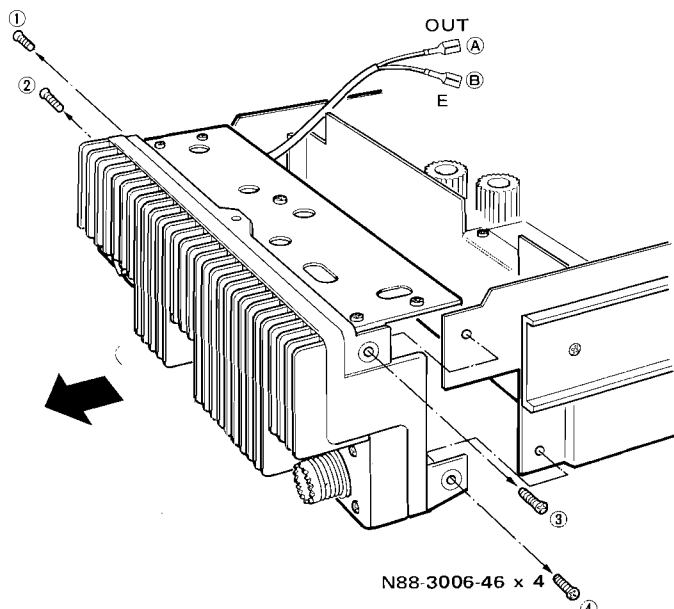


Fig. 9 Removing the Final Section

## REMOVING THE TX UNIT (Refer to Fig. 10)

1. Remove the leads (A) and (B) from terminal pins.
2. Remove the screws ①~⑤.
3. Lift TX unit up in the direction of arrow.

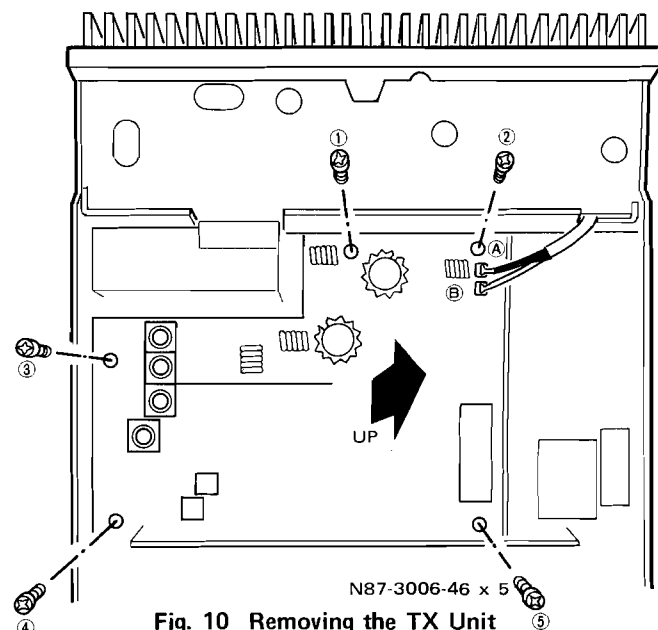


Fig. 10 Removing the TX Unit

# DISASSEMBLY

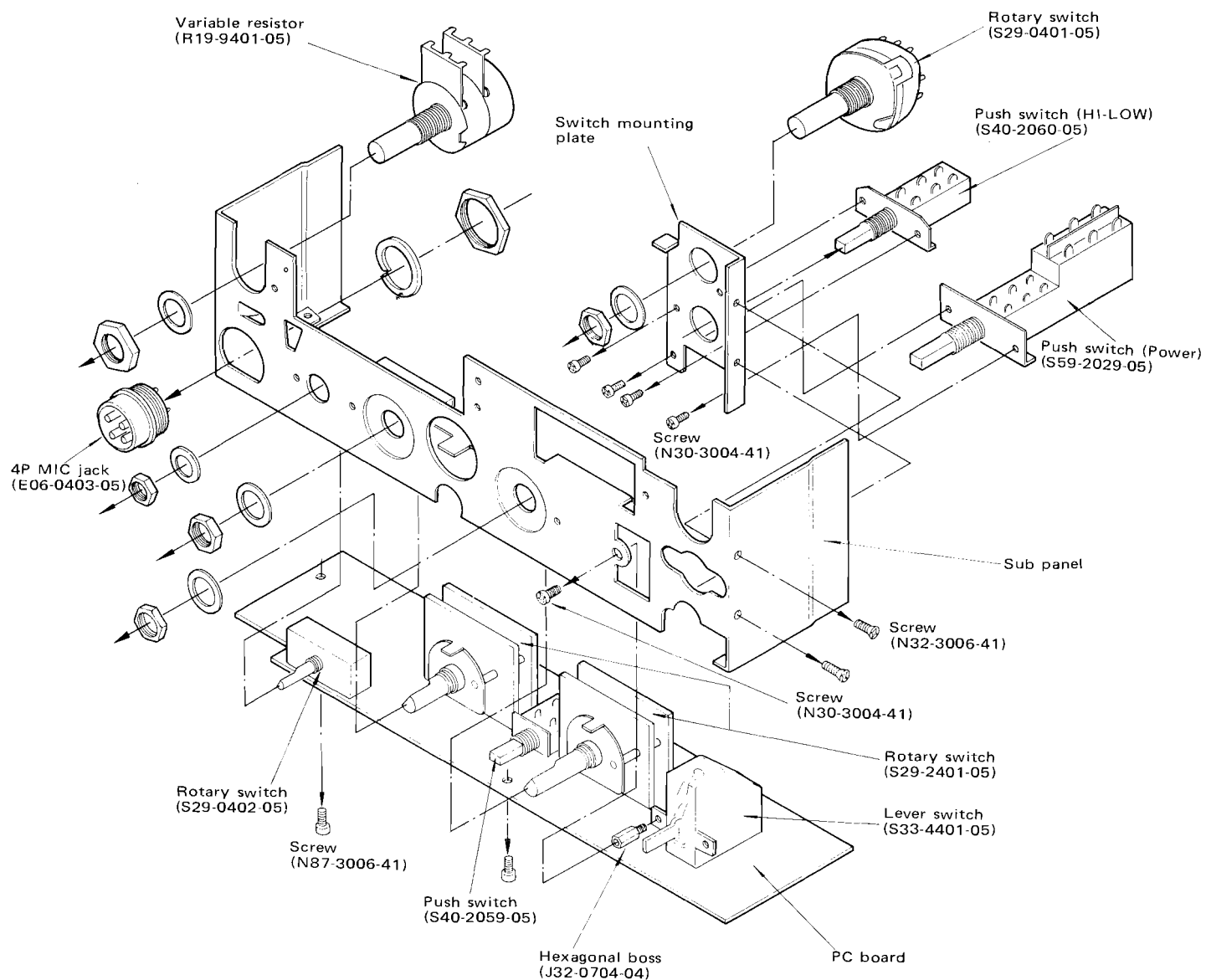


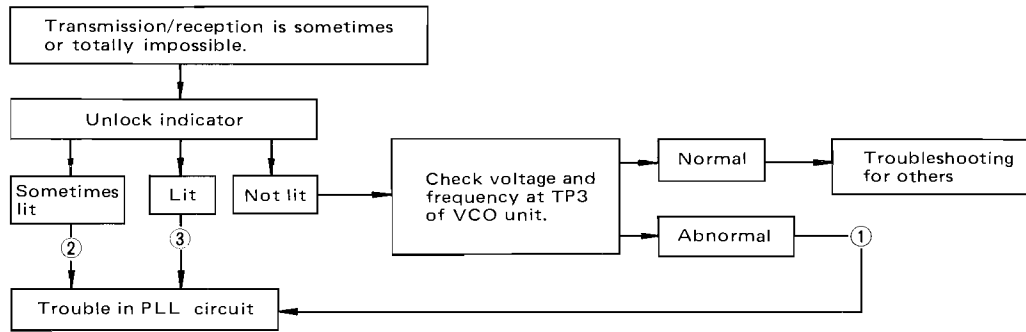
Fig. 11 Disassembling the Sub Panel

## TO REMOVING LED MOTHER BOARD

1. Remove knobs and front panel.
2. Loosen SQ/VOL control knob.
3. Remove all LED display.
4. Remove 4 screws on each corner of mother board J25-2513-03.
5. Remove 2 connectors on board.
6. Gently push to rear and lift up.

# TROUBLESHOOTING

## Troubleshooting (PLL)



| Condition | Service Point  | Possible Cause  | Measures (Remedy)  |
|-----------|--|---|--|
| ①         | 1) 5V supply at AVR circuit (main body)<br>2) VCO amplifier  | <ul style="list-style-type: none"> <li>No 5V supply due to malfunction in IC101 and Q101.</li> <li>Q12 and L15 broken</li> </ul>  | <ul style="list-style-type: none"> <li>Check voltage and replace transformer.</li> <li>Check voltage and replace transformer coil.</li> </ul>  |
| ②         | 1) VCO unit<br><br>2) PD unit.   | <ul style="list-style-type: none"> <li>Poor contact in wiring, parts, etc.</li> <li>Poor contact in wiring, parts, etc.</li> <li>Poor contact in wiring, parts, etc.</li> <li>L1 crystal broken.</li> </ul> | <ul style="list-style-type: none"> <li>Check voltages, etc.</li> <li>Check voltages and replace L16, 17 crystal.</li> <li>Check voltages.</li> <li>Check voltages and replace L1 crystal.</li> </ul>   |
| ③         | VCO unit<br>1) Voltage at 9V terminal.<br>2) RF voltage at TP2.<br><br>3) VCO frequency<br>4) Local OSC level                              | <ul style="list-style-type: none"> <li>Q10, 11 broken.</li> <li>Q18, O2, 3 or crystal broken.</li> <li>TC1 shifted</li> <li>TC4 shifted</li> </ul>  | <ul style="list-style-type: none"> <li>Check voltages.</li> <li>Check voltages and replace defective parts.</li> <li>Adjust it.</li> <li>Adjust it.</li> </ul>   |
|           | PD unit<br>1) Waveform and frequency at TP1.<br>2) Output from 12-pin of IC3.<br><br>3) Put a 135.3MHz signal of SSG into TP1 of VDO unit. | <ul style="list-style-type: none"> <li>Crystal or IC1 broken.</li> <li>IC2, 3 broken.</li> <li>IC4 (MC4044P) or IC5 ~ 12 broken.</li> </ul>   | <ul style="list-style-type: none"> <li>Check waveform and frequency, and replace defective parts.</li> <li>Check waveform and frequency, and replace defective parts.</li> <li>Check waveform and frequency, and replace defective parts.</li> <li>Check waveform at each part.</li> </ul> |

## Malfunction in Transmitter

| Symptom              | Cause   | Remedy  |
|----------------------|---|---|
| (1) No power output. | <p>A: When current drain is more than 2A during transmission.</p> <ul style="list-style-type: none"> <li>Q1, Q2, D2, or D3 defective in PA unit.</li> <li>Insufficient continuity in antenna line.</li> </ul> <p>B: When current drain is about 1.2A during transmission.</p> <ul style="list-style-type: none"> <li>Coaxial cable defective between PA unit and TX unit (in particular, connecting part.)</li> <li>Q1 defective in PA unit.</li> <li>TX unit malfunction.</li> </ul> | <p>Replacement<br/>Check</p> <p>Check<br/>Replacement<br/>Replacement</p> |

# TROUBLESHOOTING

| Symptom  | Cause  | Remedy   |
|--|--|--|
| (2) Low power.   | <ul style="list-style-type: none"> <li>Improper adjustment in protection circuit.</li> <li>TR defective in final driver stage.</li> <li>Abnormal voltage in AVR (2SD235).</li> <li>Improper adjustment for trimmer in pre-driver stage.</li> </ul>   | Readjustment<br>Replacement<br>Check<br>Readjustment                   |
| (3) Defective deflection at RF meter (under normal power supply.                           | <ul style="list-style-type: none"> <li>Antenna SWR defective.</li> <li>Improper adjustment for VR1 in PA unit.</li> </ul>  | Check<br>Readjustment  |
| (4) Excessive power range.   | A: When TX unit is normal. <ul style="list-style-type: none"> <li>Improper adjustment for TC1 ~ TC4 in PA unit.</li> </ul> B: When TX unit has a band. <ul style="list-style-type: none"> <li>Improper adjustment for TC1 ~ TC4 in TX unit.</li> <li>Improper adjustment for VR61 ~ VR63 in main-body choke printed circuit board.</li> </ul>  | Readjustment<br><br>Readjustment<br><br>Readjustment                   |
| (5) Hi-Low switchover malfunction.   | <ul style="list-style-type: none"> <li>Poor contact in Hi-Low switch.</li> <li>Improper adjustment for VR5 in TX unit.</li> <li>Q12 defective in TX unit.</li> </ul>   | Replacement<br>Readjustment<br>Replacement                             |
| (6) Consumption current deviating from 4A (approx.) at 144 MHz without antenna connection. | <ul style="list-style-type: none"> <li>Q4 defective in PA unit.</li> <li>Improper adjustment for VR3 in PA unit.</li> <li>Defective in TX unit.</li> </ul>   | Replacement<br>Readjustment<br>Readjustment                            |
| (7) Large spurious.  | A: For near-by spurious. <ul style="list-style-type: none"> <li>Improper adjustment for L7, L8 in TX unit.</li> <li>Improper adjustment for L11 ~ L14 and VR3 in TX unit.</li> <li>Improper adjustment for VR61 ~ VR63 in main-body choke printed circuit board.</li> </ul> B: For harmonics spurious. <ul style="list-style-type: none"> <li>Improper adjustment for TC1 ~ TC4 in PA unit.</li> </ul> | Readjustment<br>Readjustment<br><br>Readjustment<br><br>Readjustment   |
| (8) Transmit/receive change-over malfunction   | <ul style="list-style-type: none"> <li>Microswitch broken.</li> <li>Poor contact at MIC terminal</li> <li>Relay defective (RL101).</li> </ul>  | Replacement<br>Check<br>Replacement                                    |
| (9) Modulation impossible.   | <ul style="list-style-type: none"> <li>MIC element defective.</li> <li>Poor contact at MIC terminal.</li> <li>SW of main body and Q71 of printed circuit board defective.</li> <li>Q1 defective in TX unit.</li> <li>Improper adjustment for VR1, VR5 in TX unit (in the case of insufficient modulation).</li> </ul>  | Replacement<br>Check<br>Replacement<br>Replacement<br><br>Readjustment |
| (10) Tone squelch malfunction (in TX setting)  | <ul style="list-style-type: none"> <li>Improper insertion of printed circuit board of active filter in RX unit</li> <li>Active filter defective.</li> <li>Q11 defective in RX unit.</li> </ul> <p><b>Note:</b> If modulation degree is improper, adjust it with VR31 of RF unit.</p>   | Check<br>Replacement<br>Replacement                                    |
| (11) Tone burst malfunction.   | <ul style="list-style-type: none"> <li>Q6 ~ Q8 defective in TX unit or piezo tuning fork broken.</li> <li>Improper adjustment for VR4 or trouble in C41, D6 in the case of abnormal time constant.</li> </ul>  | Replacement<br>Readjustment<br>or replacement                          |

# TROUBLESHOOTING

## Malfunction in Receiver

| Symptom   | Cause  | Remedy   |
|---|--|--|
| (1) No noise.   | <ul style="list-style-type: none"> <li>Squelch in ON setting.</li> <li>Tone switch set to tone squelch position.</li> <li>Malfunction in audio circuit.</li> <li>Speaker lead wires defective. (in particular, connecting parts).</li> <li>Ear phone jack broken.</li> </ul> | Set squelch to OFF.<br>Set it to OFF.<br>Check voltages.<br>Check<br>Check |
| (2) Low sensitivity   | <ul style="list-style-type: none"> <li>Antenna system defective (M-type connector, antenna wires, etc.)</li> <li>RF cavity tuning shifted.</li> <li>D6 defective in VCO unit.</li> <li>Improper adjustment for L9 in RX unit.</li> </ul>                                     | Check<br>Readjustment<br>Replacement<br>Readjustment                       |
| (3) Defective deflection at S meter.  | <ul style="list-style-type: none"> <li>Meter defective.</li> <li>Improper adjustment for VR1 for meter sensitivity adjustment.</li> </ul>  | Replacement<br>Readjustment  |
| (4) Noise generated, but reception impossible.                                  | <ul style="list-style-type: none"> <li>10.245 MHz (L11) crystal defective.</li> <li>Each TR defective in receiver (RF and IF stages).</li> <li>Improper adjustment for each coil in receiver (RF and IF stages).</li> </ul>  | Replacement<br>Replacement<br>Readjustment                                 |
| (5) Squelch malfunction.  | <ul style="list-style-type: none"> <li>Tone squelch set to ON position.</li> <li>Noise amplifier malfunction or Q12, Q13 defective in RX unit.</li> <li>Improper adjustment for VR2 in RX unit.</li> </ul>   | Set it to OFF.<br>Replacement<br>Readjustment                              |
| (6) Zzz... noise generated with squelch switched ON and in the mode of TX → RX. | <ul style="list-style-type: none"> <li>D15 defective in RX unit.</li> </ul>  | Replacement  |
| (7) Tone squelch malfunction (in RX setting).                                   | <ul style="list-style-type: none"> <li>Improper insertion of printed circuit board of active filter in RX unit.</li> <li>Q11, Q19 ~ 21, or D11 ~ D14 defective in RX unit.</li> </ul>  | Check<br>Replacement   |
| (8) Howling caused near AF VR MAX.  | <ul style="list-style-type: none"> <li>Insufficient tightening of bolts for case, printed circuit boards, speaker, etc.</li> <li>C16 coming too close to C22 in VCO unit.</li> </ul>   | Check<br>Separate them.  |
| (9) Howling near AF VR MAX.   | <ul style="list-style-type: none"> <li>VCO coil is loose on coil form.</li> </ul>  | Reseal with glue.  |

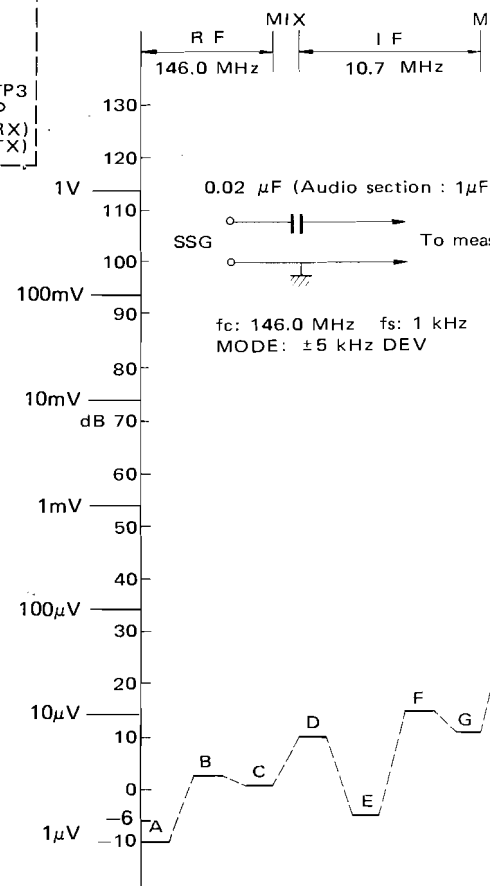
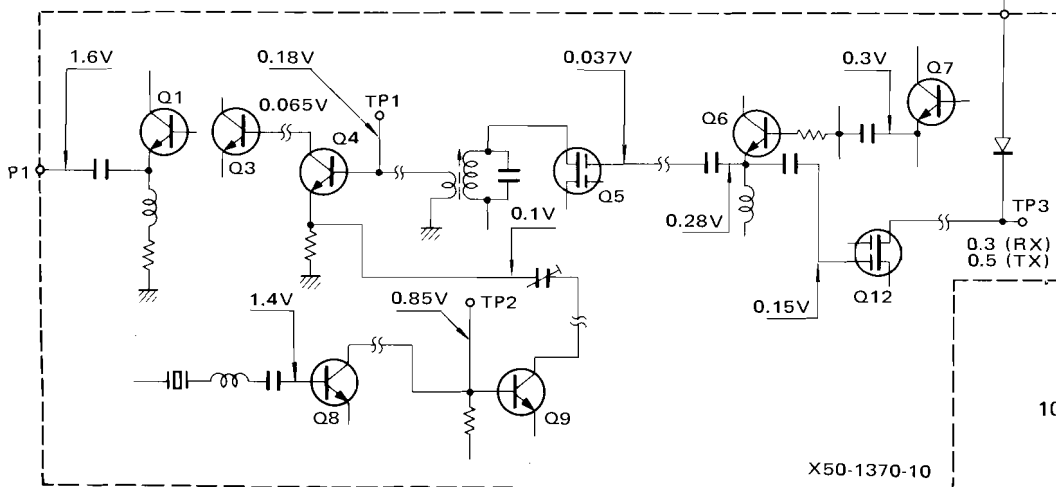
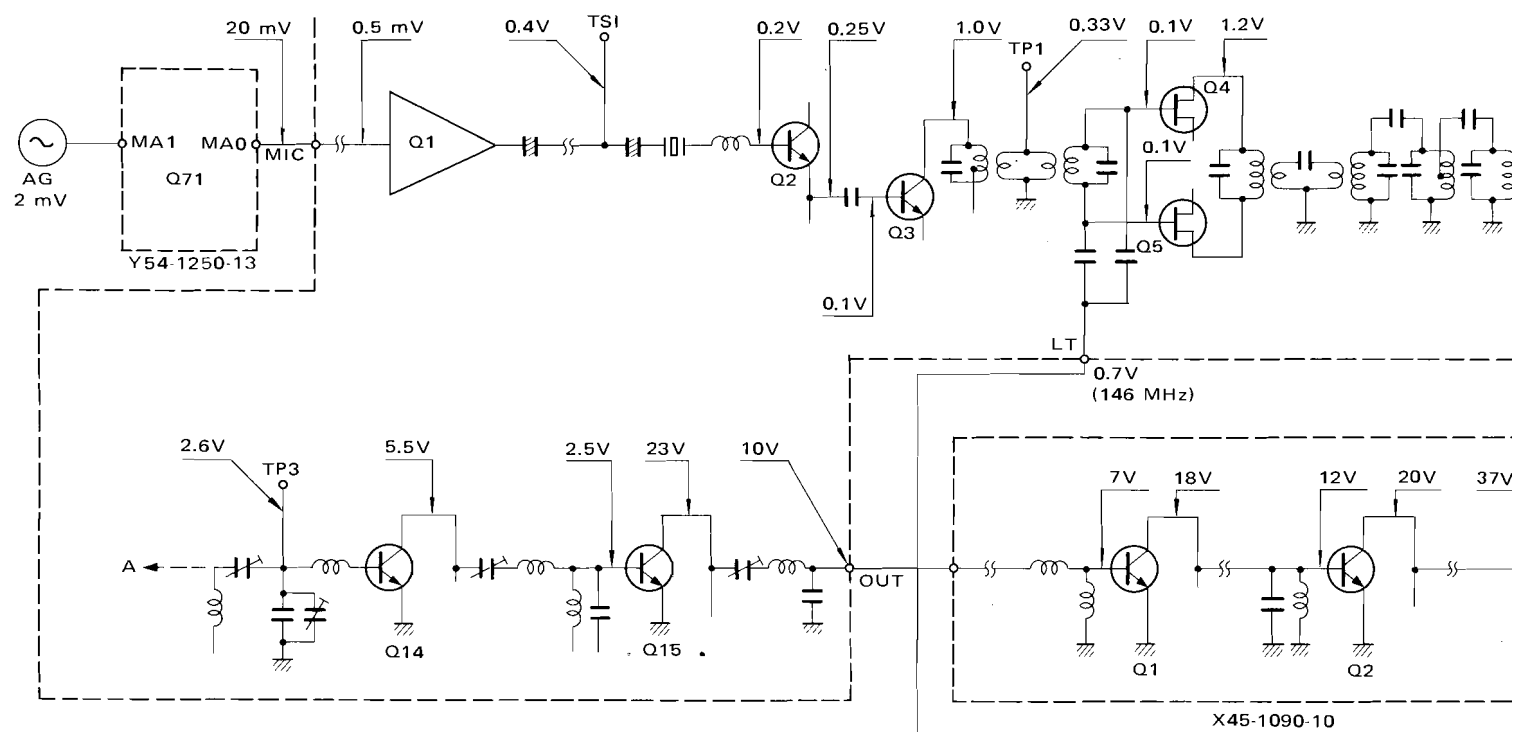
## Malfunction in Others

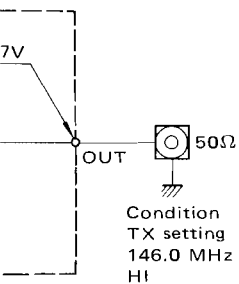
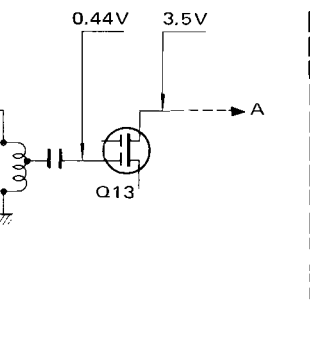
| Symptom                                      | Cause  | Remedy   |
|--|--|--|
| (1) F display LED not lit or letter trouble. | <ul style="list-style-type: none"> <li>No 5V AVR output.</li> <li>LED defective.</li> <li>Driving IC (IC1 ~ IC3) defective.</li> <li>Rotary switch for F in trouble.</li> <li>Poor contact around sockets in display and LED printed circuit boards.</li> <li>Poor contact between pin and connector with lead wire of display printed circuit board.</li> </ul> | Check<br>Replacement<br>Replacement<br>Check<br>Check<br>Check |
| (2) No power supply.                         | <ul style="list-style-type: none"> <li>No fuse in fuse holder.</li> <li>Disconnection or improper soldering in power cable.</li> <li>Power switch broken.</li> </ul>   | Provide fuses.<br>Check<br>Replacement                         |
| (3) Fuses blowing out.                       | <ul style="list-style-type: none"> <li>Power circuit connected reversely.</li> </ul>   | Check.   |



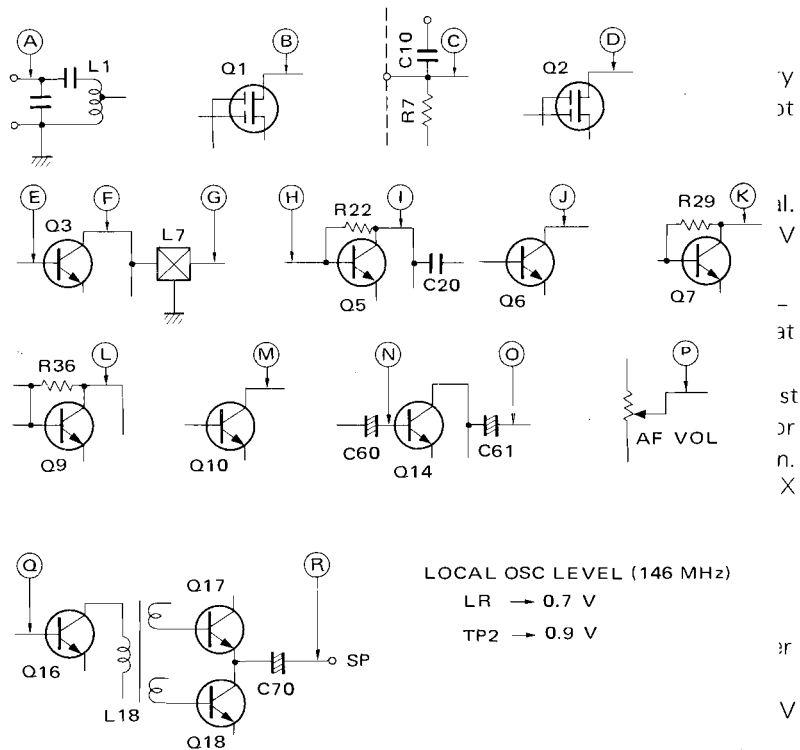
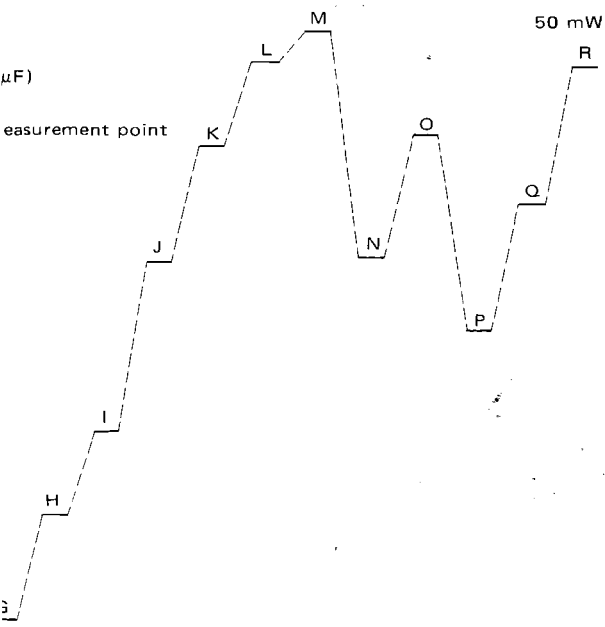
# TRANSMITTER SECTION

## LEVEL DIAGRAM





# RECEIVER SECTION



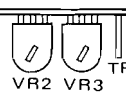
# ADJUSTMENT (PARTS ALIGNMENT)

TF

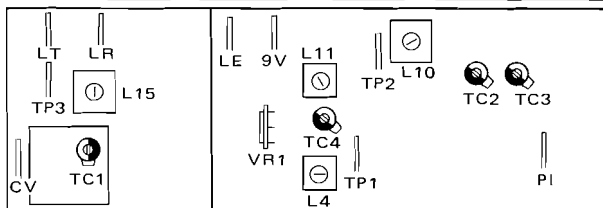
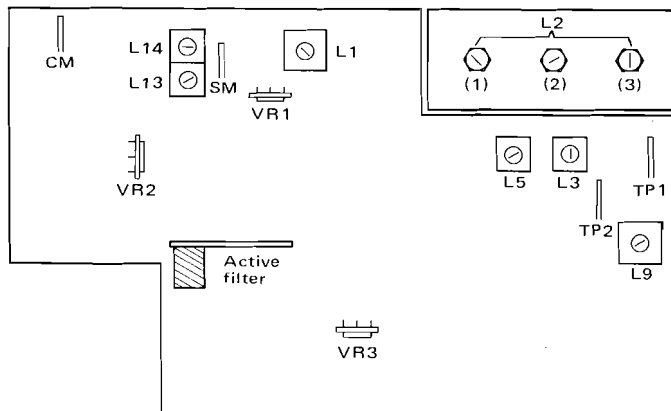
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P10

PA UNIT (X45-1090-10)



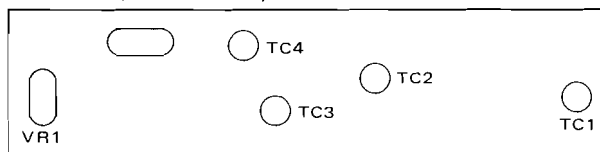
RX UNIT (X55-1150-10)



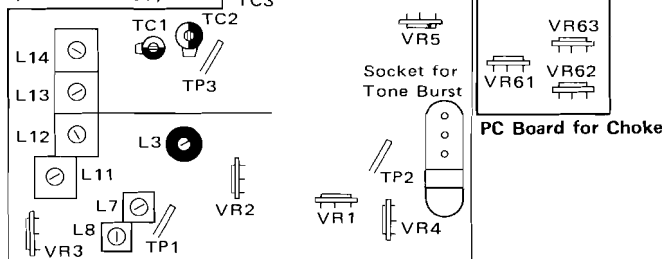
VCO UNIT  
(X50-1370-10)

Front panel

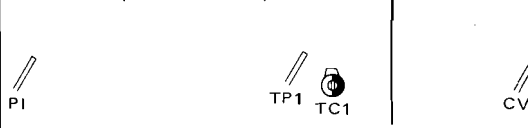
PA UNIT (X45-1090-10)



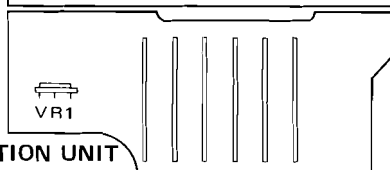
TX UNIT  
(X56-1230-10)



PD UNIT (X50-1380-10)



INDICATION UNIT  
(X54-1210-10)



Front panel

# ADJUSTMENTS

## TEST EQUIPMENT REQUIRED

### 1. Frequency Counter

Frequency range: Up to 150 MHz or more

### 2. SSG (Standard Signal Generator)

Capable of generating frequencies centering on 145 MHz, variable in amplitude, and also of frequency modulation.

Output voltage: -10 dB~100 dB

AM: 30% modulation at 1 kHz

FM: 7.5 kHz (1 kHz)

### 3. Oscilloscope

High-sensitivity oscilloscope, with external synch.

### 4. AF Vacuum-Tube Voltmeter

Frequency range: 50 Hz~10 kHz

Input resistance: 1 megohm minimum

Voltage range: F.S. = 3 mV up to 30 volts

### 5. RF Vacuum-Tube Voltmeter

Frequency range: 150 MHz or more

### 6. Vacuum-Tube Voltmeter

Input impedance: 10 megohms or more

Voltage range: F.S. = 0.1 up to 1000 volts, AC and DC.

### 7. Power Meter

Power range: F.S. = 50W, 20W, 3W at 150 MHz or more

Input impedance of the meter should be 50 ohms.

### 8. Linear Detector

Frequency range: 150 MHz or more

Frequency deviations: 10 kHz or more

The detector need not be used where high accuracy of measurement is not required.

### 9. AG (Audio Generator)

Output: 300 Hz~5 kHz

Output voltage: 0.5 mV~1 V

### 10. AF Dummy Load

8 ohms and 3 watts approximately.

### 11. DC Regulated Power Supply

Voltage range: 9 V~16 V

Current range: 10A or more

### 12. Sweep Generator

Center frequency: 145 MHz

Frequency deviation: Maximum  $\pm 5$  kHz

Output voltage: More than 0.1 V

Sweep rate: At least 0.5 sec./cm

### 13. Center Meter

Input sensitivity: 50  $\mu$ V or so

### 14. Detector

Construct the following circuit:

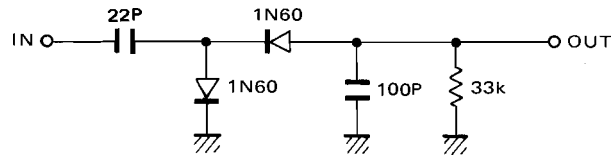


Fig. 12 Detector

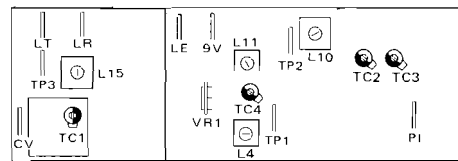
## ADJUSTMENT OF THE TR-7400A

### 1. ADJUSTMENT OF PLL

#### 1.1 Test Equipment Used

- (1) RF VTVM
- (2) Frequency counter
- (3) DC voltmeter
- (4) DC power source

#### 1.2 Preliminary CK of VCO & PLL



VCO Unit

If this check is performed successfully, it is not necessary to perform sec. 1.3 step 1-11. It should be stressed not to turn factory sealed parts.

1. Set TR-7400A to 146.00 MHz simplex.
2. Adjust VR1 on VCO to measure 9.00V at 9V terminal.
3. Adjust TC1 inside metal box on VCO to read 5.00V at CV terminal.
4. Check for 2.560000 MHz  $\pm 20$  Hz at TP1 on PLL board adjust TC1 if necessary (must use 33 pF cap at TP1).
5. Measure frequency at LR terminal on VCO. Adjust TC3 for 135.3000 MHz  $\pm 100$  Hz. Adjust TC2 for 135.3050 MHz  $\pm 100$  Hz with 5k/0 control in 5k position.
6. To set TX final frequency TX and adjust L3 on TX board for final frequency.

#### 1.3 Adjustment The VCO Unit (X50-1370-10)

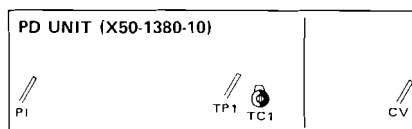
- (1) Set the frequency to 146.000 MHz. Set the other controls at any positions.
- (2) Adjust the DC voltage across the 9-V terminal to 9 V (8.8 ~ 9.2V) with VR1.

# ADJUSTMENTS

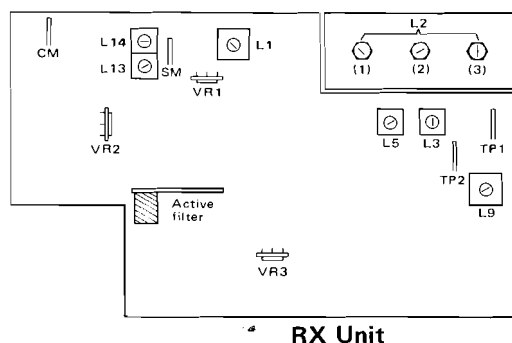
- (3) Connect the VTVM to terminal TP2 and adjust the core of L10 180° counterclockwise from the point where oscillation begins.  
RF voltage of TP2 = 0.7 ~ 1 V
- (4) Adjust the core of L11 so that the RF voltage across terminal TP1 is maximum.  
RF voltage at TP1 = 0.15 ~ 0.3V
- (5) Adjust the core of L11 so that the RF voltage at terminal PI is maximum, and then readjust the core of L4. RF voltage at PI = 1 ~ 2 V
- (6) Adjust TC1 so that the DC voltage terminal CV is 5 V.

**Note:** The PLL will work properly after steps (1) ~ (6) and the unlock indicator on the panel will go off.

- (7) Adjust the core of L15 so that the RF voltage at terminal LR is maximum.  
RF voltage at LR = 0.3 ~ 1 V
- (8) Adjust TC1 so that the frequency at TP1 (measured through 33 pF) in the PD unit (X50-1380-10) is 2.560000 MHz  $\pm$ 20 Hz.



- (9) Measure the frequency at terminal LR.  
TC3: 135.3000 MHz  $\pm$ 100 Hz  
TC2: 135.3050 MHz  $\pm$ 100 Hz with 5k/0 control set at 5k  
Adjust the frequency as noted above.
- (10) Set the MHz control to 5, adjust the cores of L4 and 11 so that the RF voltage at terminal PI is maximum. Reset the MHz control to 7 and adjust TC4 so that the RF voltage is 1.7V. Repeat these adjustments three times because the adjustment of TC4 affects with the setting of L4 and 11.
- (11) Set the MHz control to 6. Give the core of L15 three turns in the clockwise direction (put the core to middle of the form) so that the RF voltage at terminal TP2 in the RX unit (X55-1150-10) is maximum, and then adjust L-9 in the RX unit.  
Repeat the adjustment three times or so because both coils are mutually related.  
RF voltage at TP2 of RX unit = 0.8 ~ 1.2 V



## 1.4 Check Point

- (1) Unlock circuit and its indicator.
  - A. When TP1 of VCO unit (X50-1370-10) is grounded with controls set arbitrarily.
    - (a) The unlock indicator on the panel should light.
    - (b) The RF voltage at TP2 of the RX unit (X55-1150-10) should be attenuated by 20 dB or more.
  - B. When the MHz control is turned rapidly, the unlock indicator should go on and off.
- (2) Frequency setting and its digital display circuit
  - A. When the MHz control is turned from 4 to 7, the frequency at terminal TP2 of the RX unit (X55-1150-10) should vary in steps of 1 MHz.
  - B. When the 100 kHz control is turned from 0 to 9 with the MHz control set at 7, the frequency at TP2 of the RX unit should vary in steps of 100 kHz.
  - C. When the 10 kHz control is turned from 0 to 9 with the 100 kHz control set at 9, the frequency at TP2 of the RX unit should vary in steps of 10 kHz.
- (3) Repeater circuit ( $\pm$ 600 kHz TX shift) and its indicator  
Set the frequency as given below.  
145.99  
147.00

When the repeater switch is set at -600 or +600 and at OFF (SIMP), frequency should be differ by 600 kHz only in the transmission mode.  
(Frequency tolerance: within  $\pm$ 100 Hz) Check the frequency at TP3 of the VCO unit (X50-1370-10).

## 2. ADJUSTMENT OF RX UNIT

### 2.1 Test Equipment Used

- (1) DC power source
- (2) Sweep generator
- (3) Oscilloscope
- (4) Jig for helical stage
- (5) RF VTVM
- (6) SSG
- (7) AG
- (8) AF VTVM

### 2.2 Helical Adjustment

- (1) Ground TP2 and terminal LE of the VCO unit (X50-1370-10).
- (2) Connect the detector for helical adjustment to TP1 of the RX unit.
- (3) Looking at the waveform appearing on the oscilloscope, make adjustment in the following way.  
Adjust L1 and L2 (3 piston trimmers) alternately so that the markers appear as shown Fig. 14.

# ADJUSTMENTS

- Note 1:** Adjust the core of L1 so that the waveform is symmetrical.  
**Note 2:** The waveform should have three peaks.  
**Note 3:** Adjust carefully so that the waveform is symmetrical.  
 (4) Remove the wire used to ground terminal LE.  
**Note:** See "Adjustment of PLL", (11) for the adjustment of L10.

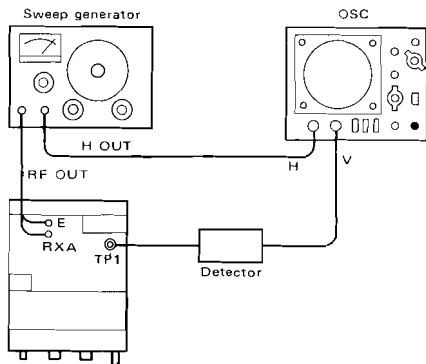


Fig. 13 Helical Adjustment

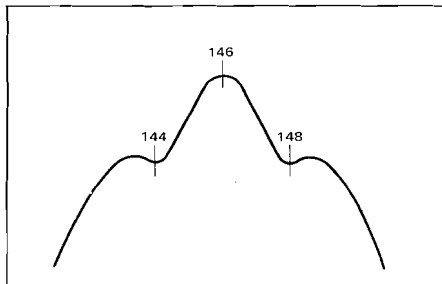


Fig. 14 Helical Output Waveform

## 2.3 Sensitivity Adjustment

- (1) Setting
  - (a) Adjust the source voltage to 13.8 V
  - (b) Set DEV of SSG to  $\pm 5$  kHz.
  - (c) Set modulation frequency of SSG to 1 kHz.
  - (d) Set controls as given below:  
 146.00  
 SQVR: turn counterclockwise fully  
 Tone switch: off
  - (e) Observe AF output across 8-ohm dummy connected to EXT SP.
- (2) Receive 146.0 MHz (10 ~ 20 dB) from SSG. Adjust the tuning knob of the SSG for maximum S meter deflection.
- (3) Adjust a piston trimmer at the output side of L2 of the RX unit alternately with L3, L5 and L8 for maximum S meter indication.

## 2.4 Discriminator Adjustment

- (1) Adjust L13 and L14 of the RX unit repeatedly for maximum AF VTVM indication.
- (2) Disconnect the SSG output and connect a center meter to terminal CM. Adjust L14 alone so that the center meter indicates "0"

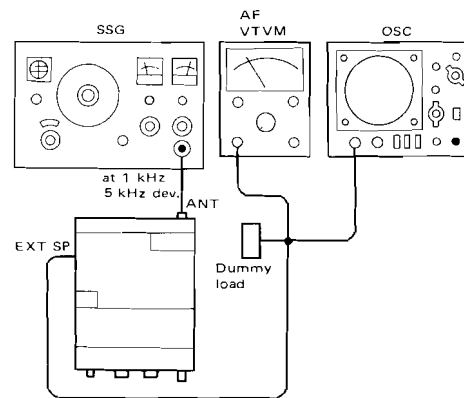


Fig. 15 Sensitivity Adjustment

## 2.5 Squelch Adjustment

- (1) Set the SQU knob at the 11-o'clock position and without receiving any signal, adjust VR2 of the RX unit so that reception noise just diminishes (by turning it in the diminishing direction).
- (2) When a signal of -6 dB is applied from the SSG, the squelch should open.

## 2.6 S Meter Adjustment

- (1) Set the SSG's output to 30 dB. Fine-adjust the SSG's tuning knob again for maximum S meter indication.
- (2) Adjust VR1 of the RX unit so that the S meter indicates "10"

## 2.7 Sensitivity Measurement

- 20 dB noise quieting sensitivity: 0.7  $\mu$ V or better
- S/N: 40 dB or more at 40 dB (1 mV) of input (1 kHz, 70% modulation)

## 2.8 Checking Tone Squelch Operation

- (1) Connect AG to SSG in order to operate SSG in external modulation. With SSG output set to 0 dB, apply AG signal of  $\pm 0.5$  kHz DEV. at 151.4 Hz.
- (2) Connect a 151.4 Hz active filter to the active filter socket of the RX unit.
- (3) Tune the SSG to 146.0 MHz. Make sure that reception is possible even when the tone switch is set to SQ. Make sure that reception becomes impossible when external modulation has been cut off. After checking, the test equipment should be disconnected.

# ADJUSTMENTS

## 3. ADJUSTMENT OF TX UNIT

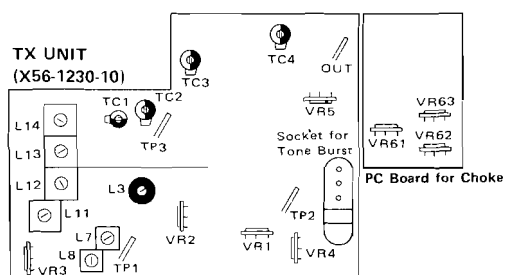
Technicians should be encouraged not to turn factory sealed transformers but to check each stage for output.

### 3.1 Test Equipment Used

- (1) Power source:
- (2) Power meter
- (3) Frequency counter
- (4) Linear detector
- (5) AG
- (6) RF VTVM

### 3.2 Adjustment of 10.7 MHz

- (1) Setting
    - (a) Adjust frequency to 145.5 MHz and turn off the repeater switch.
    - (b) Remove drive to final at "out" of TX unit.
  - (2) Connect the frequency counter to TP1 of the TX unit. Key the transmitter and adjust L3 so that it read 10.700 MHz (10.7 MHz  $\pm$ 200 Hz).
  - (3) Connecting the RF VTVM to the same TP1, adjust L7 and L8 for maximum indication.
- The core of L7 should be in the center of the core.



### 3.3 Adjustment of MIX Stage

- (1) Connect the RF VTVM to TP3 of the TX unit and key the transmitter. Adjust L11, L12, L13, L14, TC1 and TC2 repeatedly for maximum indication.
- (2) Set the frequency to 144.5 MHz and adjust VR61 on the choke circuit board for maximum indication.
- (3) Set the frequency to 146.5 MHz and adjust VR62 for maximum indication.
- (4) Set the frequency to 147.5 MHz and adjust VR63 for maximum indication.

### 3.4 Adjustment of Predrive

- (1) Set the frequency to 146.0 MHz and connect the power meter to the OUT terminal of the TX unit (50 ohms).
- (2) Adjust TC3 and TC4 of the TX unit for maximum indication. The output level should then be 1.3 W or more.

### 3.5 Adjustment of Tone Burst Time

- (1) Set the tone switch to BRU. Connecting an oscilloscope to TP2 of the TX unit in reception mode, plug a tone burst oscillating element of 1,800 kHz into the tone burst socket.
- (2) Watching the waveform on the oscilloscope, make sure that the level is about 0.12 V with the AF VTVM.
- (3) Watching the waveform, make sure that it diminishes about 0.5 second after the transmitter is keyed. If the delay is not as specified, adjust VR4 of the TX unit.

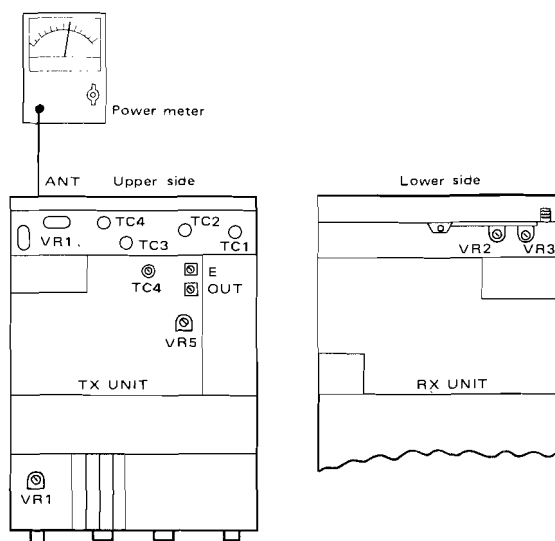


Fig. 16 Adjustment of PA Section, RF Meter and Low Power

# ADJUSTMENTS

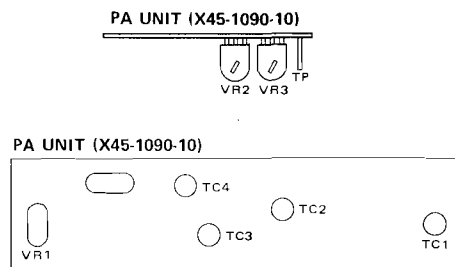
## 3.6 Adjustment of PA Unit

- (1) Connect the 50W wattmeter to the ANT terminal (type M).
- (2) Connect the lead which connects the PA unit with the TX unit to OUT of the TX unit.
- (3) Set the frequency to 146.0 MHz. Set the Hi/Low switch to Hi.
- (4) Key the transmitter and adjust TC4 of the TX unit, TC1, TC2, TC3 and TC4 of the PA unit for maximum indication.

**Note 1:** VR3 of the PA unit shall be turned fully counterclockwise.

**Note 2:** The maximum power shall be 28 W or more.

- (5) Set the frequency to 146.5 ~ 147.0 MHz, and adjust TC2 for maximum power output. It should be done to make the output at 147.9 MHz greater than that at 144.9 MHz. Make sure of the difference in power at 144.9 MHz and 147.9 MHz.
- (6) The power should be 25 W or more at Hi in between 144.0 and 148.0 MHz.



## 3.7 Adjustment of RF Meter

Adjust VR1 of the PA unit so that the RF meter indicates "8" at 146.0 MHz, Hi power position.

## 3.8 Adjustment of Low Power

- (1) Set the frequency to 147.9 MHz and the Hi/Low switch to Low. Adjust VR5 of the TX unit so that the power meter indicate 9.0 W.
- (2) Adjust VR1 of the display unit so that the power meter indicate 9.0 W at the frequency of 144.0 MHz with the Hi/Low switch set at Low.
- (3) The power should be 8~15 W at Low position in between 144.0 and 148.0 MHz.

## 3.9 Adjustment of DEV (Deviation)

- (1) Transmitting 146.0 MHz at Low and modulating it with microphone input of 1 kHz and 30 mV, adjust VR2 of the TX unit so that DEV become  $\pm 5$  kHz.
- (2) Similarly, adjust VR1 of the TX unit so that DEV become  $\pm 3.5$  kHz at a microphone input of 3 mV
- (3) Removing microphone input and setting the tone

switch to SQ, adjust VR3 of the RX unit so that DEV become  $\pm 1$  kHz.

**Note:** An active filter is needed as a jig.

## 3.10 Adjustment of Protection Circuit

- (1) Connect a DC voltmeter of 1 ~ 0.3 V range to terminal TP (on the filter circuit board). Adjust VR2 for minimum indication at a frequency of 146.0 MHz and the Hi setting.
- (2) Set the frequency to 144.0 MHz and remove the wattmeter. Adjust VR3 quickly so that current consumption become 4 A.

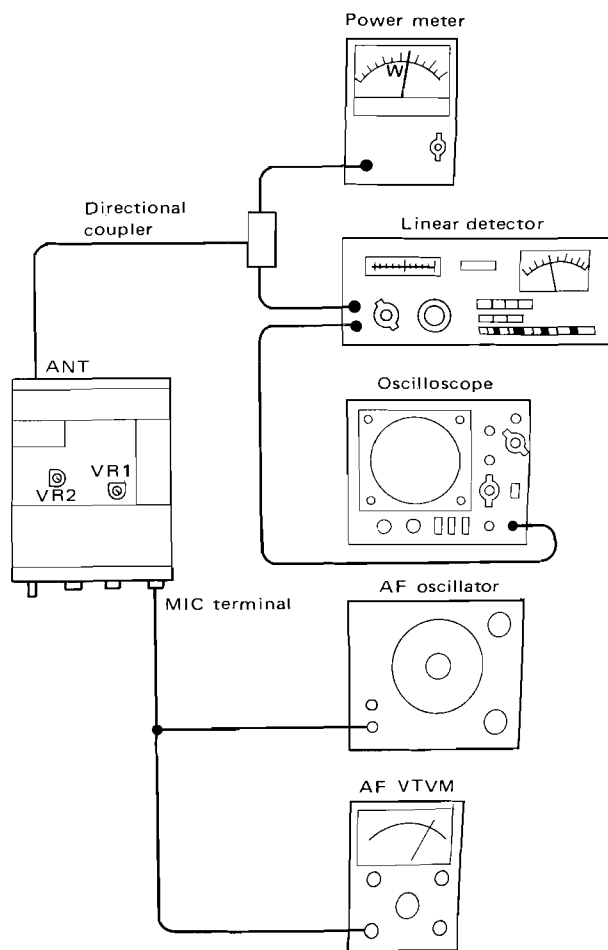


Fig. 17 Adjustment of DEV (Deviation)

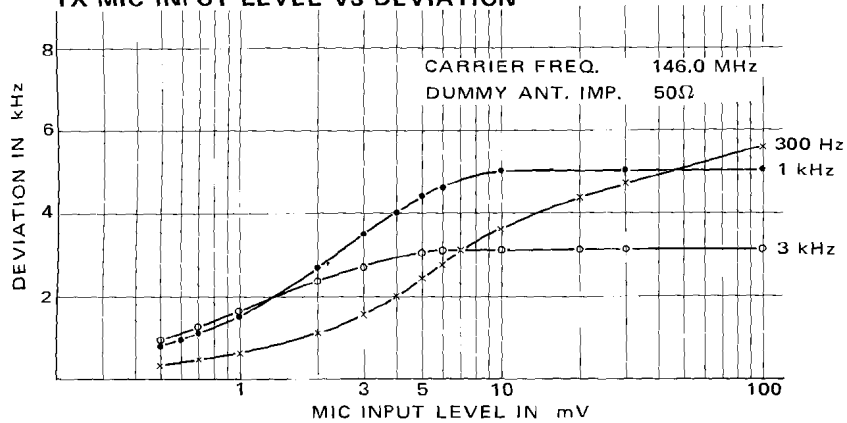


# ADJUSTMENTS

## REFERENCE DATA

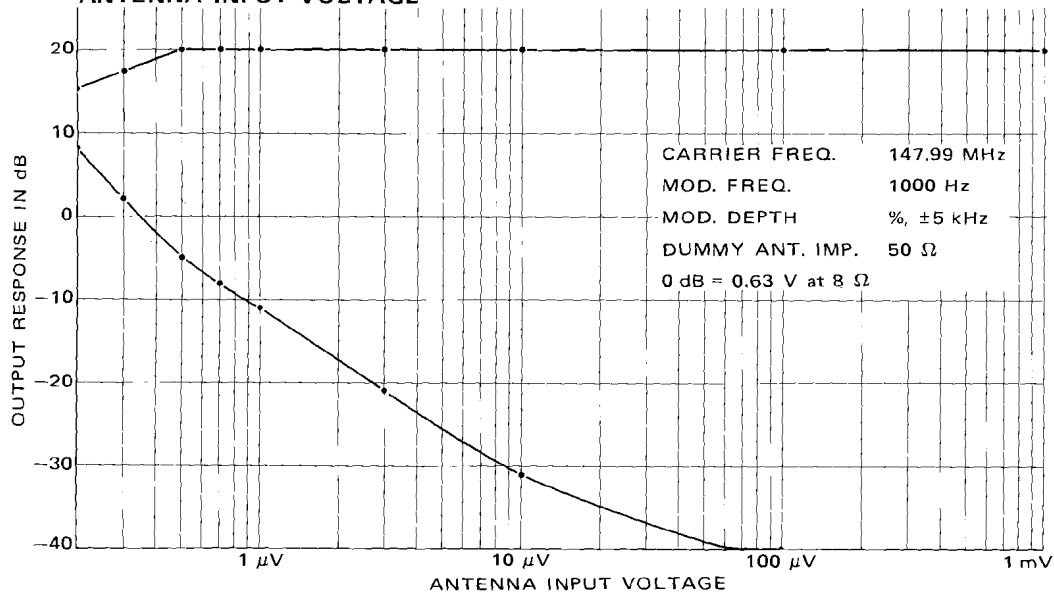
### Example 1

#### TX MIC INPUT LEVEL VS DEVIATION



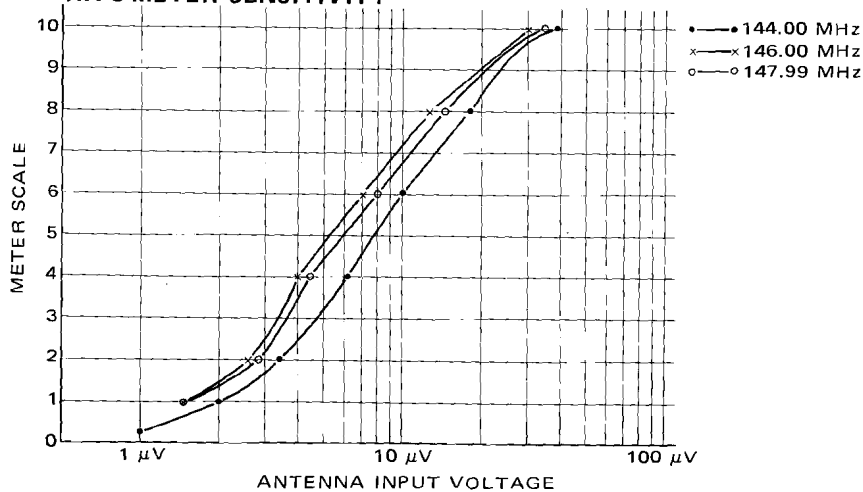
### Example 2

#### RX SIGNAL TO NOISE RATIO, OUTPUT LEVEL VS ANTENNA INPUT VOLTAGE



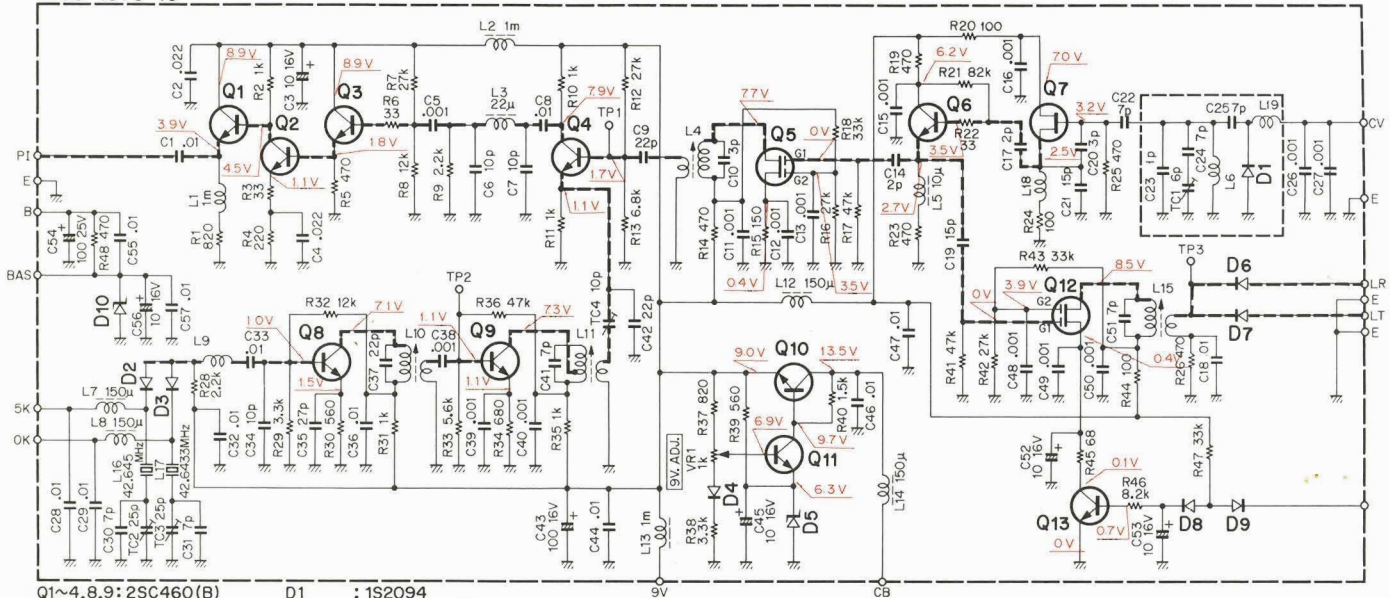
### Example 3

#### RX S-METER SENSITIVITY

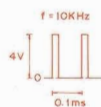
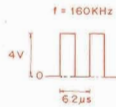


# SCHEMATIC DIAGRAM

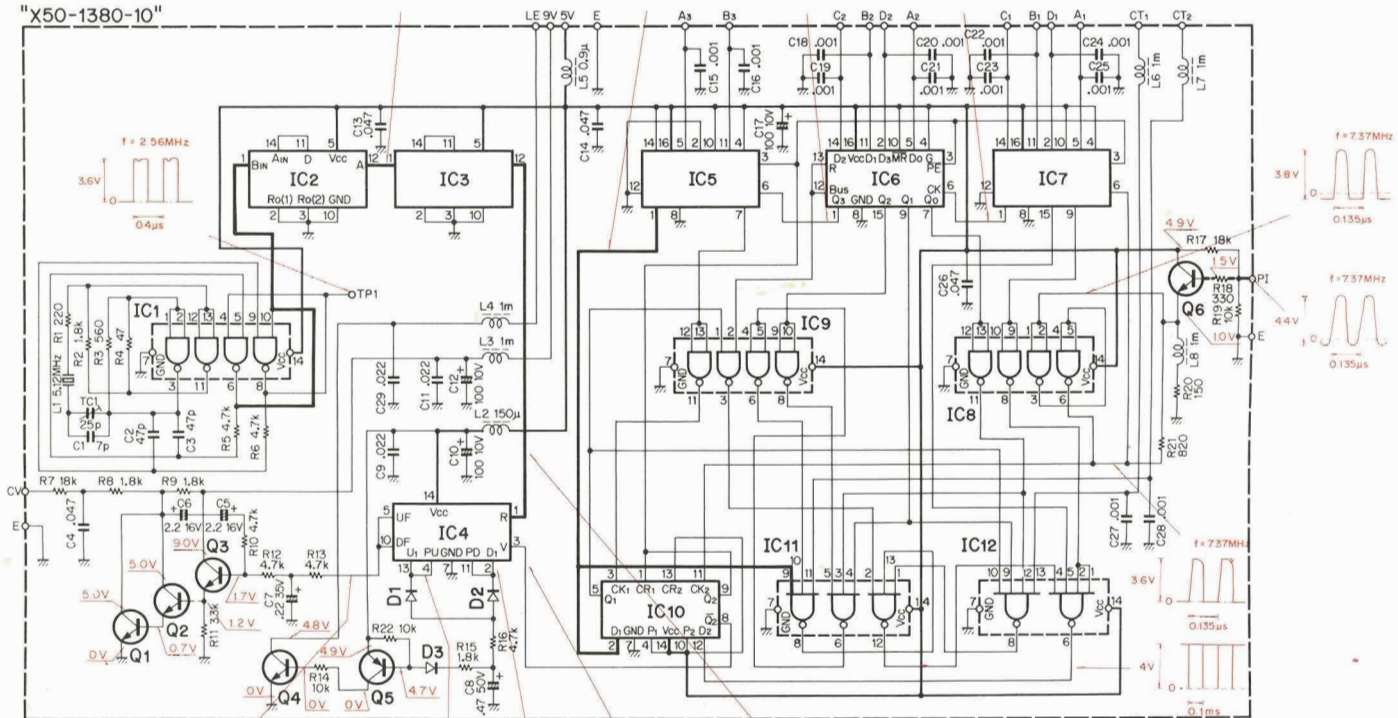
"X50-1370-10"



Q1~4,8,9: 2SC460(B)  
Q5,12 : 3SK41 (L)  
Q6,7 : 2SC785(Y)  
Q10 : 2SC496(Y,O)  
Q11,13 : 2SC733(Y)  
D1 : 1S2094  
D2,3,6,7 : 1S2588  
D4,8,9 : 1S1555  
D5 : WZ-061  
D10 : WZ-090



"X50-1380-10"

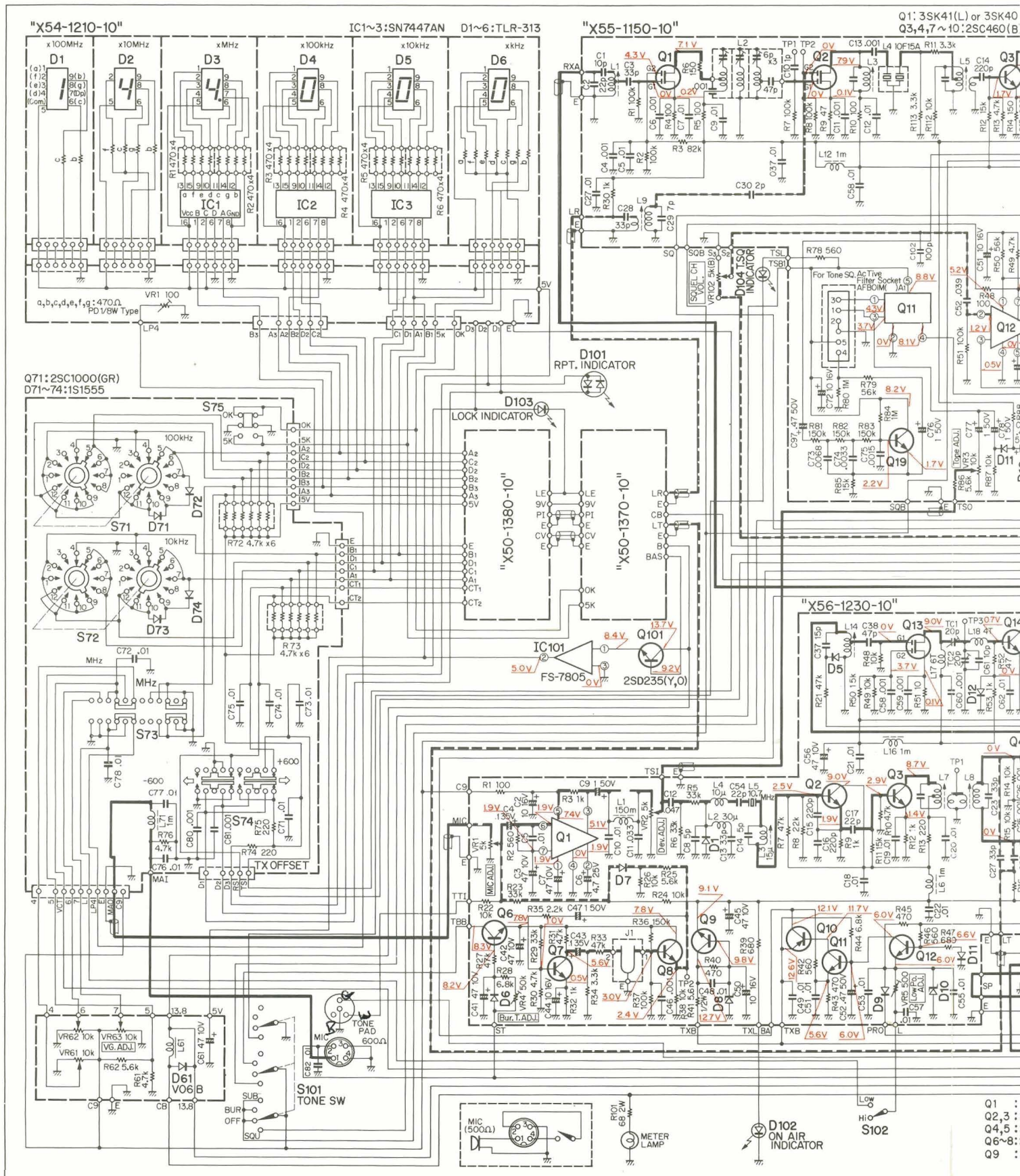


IC1, 8, 9: TD3400AP, IC2, 3: TD3493BP, IC4: MC4044P, IC5~7: MC4016P(MC74416P), IC10: TD3474AP, IC11: TD3410AP  
IC12: TD3420AP, Q1, 2: 2SC458(B), Q3: 2SC1345(E), Q4: 2SC733(Y), Q5: 2SA495(Y), Q6: 2SC460(B), D1~3: 1S1555



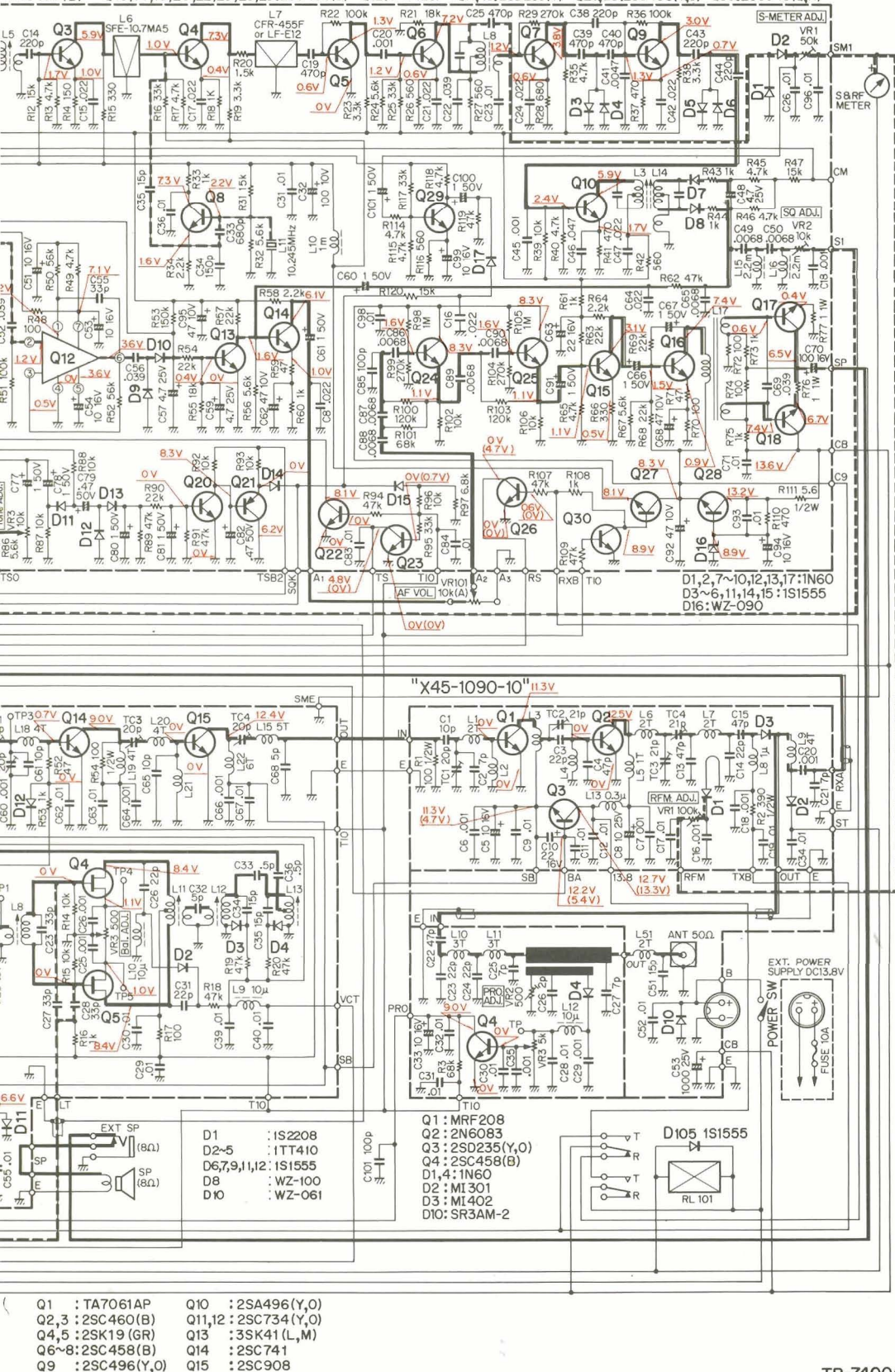


# SCHEMATIC DIAGRAM



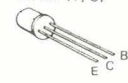


L or 3SK40(L) Q2:3SK41(L,M) Q5,6,15,24,25:2SC1000(GR) Q11:H8D5022 Q16:2SC734(Y) Q21:2SA495(Y,O)  
2SC460(B) Q13,14,19,20,22,23,26,29:2SC458(B) Q12:TA7120P Q17,18:2SD235(Y) Q27,28:2SC496(Y,O) Q30:2SC945(Q,R)

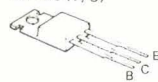


TR-7400A

2SC1000 (GR)  
2SC785 (Y)  
2SC733 (Y)  
2SA495 (Y)  
2SC734 (Y, O)



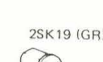
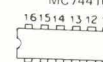
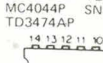
2SD235 (Y, O)



FS-7805



INPUT OUTPUT



## TR-7400A TERMINAL

|                        |   |                        |
|------------------------|---|------------------------|
| <b>L</b>               | = | Low Power              |
| <b>LP</b>              | = | Low Power              |
| <b>PI</b>              | = | Programmable Input     |
| <b>CV</b>              | = | Control Voltage        |
| <b>LR</b>              | = | Local RX               |
| <b>LT</b>              | = | Local TX               |
| <b>BAS</b>             | = | Base of Transistor     |
| <b>5 K</b>             | = | Crystal for 5 kHz Up   |
| <b>0 K</b>             | = | Crystal for 0 kHz      |
| <b>LE</b>              | = | Lock Error             |
| <b>CT1</b>             | = | Control Terminal No. 1 |
| <b>CT2</b>             | = | Control Terminal No. 2 |
| <b>TS</b>              | = | TX Switching           |
| <b>RS</b>              | = | RX Switching           |
| <b>MAO</b>             | = | MIC Amp Output         |
| <b>C9</b>              | = | Common 9 V             |
| <b>CB</b>              | = | Common B Line          |
| <b>TBB</b>             | = | Tone Burst B Line      |
| <b>TTI</b>             | = | Touch Tone Input       |
| <b>TXB</b>             | = | TX B Line              |
| <b>TXL</b>             | = | TX Lamp (on air)       |
| <b>BA</b>              | = | Base of Transistor     |
| <b>PRO</b>             | = | Protection             |
| <b>SB</b>              | = | Stabilized B Line      |
| <b>VCT</b>             | = | Voltage Control Tuning |
| <b>ST</b>              | = | Stand-by               |
| <b>SM<sub>1</sub></b>  | = | S Meter                |
| <b>SP</b>              | = | Speaker                |
| <b>RXA</b>             | = | RX Antenna             |
| <b>SQB</b>             | = | Squelch B Line         |
| <b>TSB<sub>2</sub></b> | = | Tone Squelch B Line    |
| <b>TS</b>              | = | TX Switching           |
| <b>T10</b>             | = | TX 10 Volt Line        |
| <b>RS</b>              | = | RX Switching           |
| <b>CM</b>              | = | Center Meter           |
| <b>TSO</b>             | = | Tone Squelch Output    |
| <b>SQ</b>              | = | Squelch Control        |
| <b>TSL</b>             | = | Tone Squelch Lamp      |
| <b>A<sub>1</sub></b>   | = | AF Output              |
| <b>SQK</b>             | = | Squelch Control        |

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